An Illustrated Microscopic Identification of Chinese Materia Medica

中药显微鉴别图鉴

Zhao Zhongzhen Editor in Chief

赵中振 主编



辽宁科学技术出版社

LIAONING SCIENCE AND TECHNOLOGY PUBLISHING HOUSE



国际中医药学会（澳门）专著

International Society for Chinese Medicine (ISCM) Monograph

An Illustrated Microscopic Identification of Chinese Materia Medica

中药显微鉴别图鉴

International Society for Chinese Medicine (ISCM) Monograph

国际中医药学会专著

Zhao Zhongzhen Editor-in-chief

赵中振 主编



辽宁科学技术出版社

·沈阳·

图书在版编目（CIP）数据

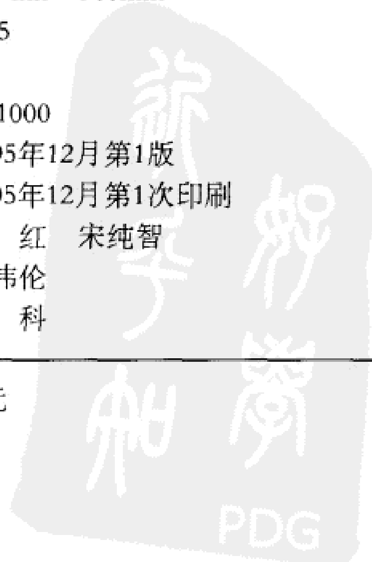
中药显微鉴别图鉴/赵中振主编. 一沈阳：辽宁科学技术出版社，2005
ISBN7-5381-4591-5

I. 中… II. 赵… III. 中药鉴定学一显微结构一图谱 IV. R282. 5-64

中国版本图书馆CIP数据核字（2005）第122865号

出版发行：辽宁科学技术出版社
（沈阳市和平区十一纬路25号 邮编：110003）
印 刷 者：深圳中华商务安全印务股份有限公司
幅面尺寸：185mm×260mm
印　　张：26.5
插　　页：4
印　　数：1~1000
出版时间：2005年12月第1版
印刷时间：2005年12月第1次印刷
责任编辑：刘　红　宋纯智
封面设计：殷伟伦
责任校对：廖　科

定价：200.00元



Editor-in-Chief



Prof. Zhao Zhongzhen is currently the course director of the Bachelor of Pharmacy (Hons) in Chinese Medicine, School of Chinese Medicine, Hong Kong Baptist University. He is also a member of the Chinese Medicines Board of the Chinese Medicine Council of Hong Kong and a member of the HKSAR Department of Health Scientific Committee on Hong Kong Chinese Materia Medica Standards. Dr. Zhao has long been engaged in the study of Chinese medicines resources, species and quality.

- 1982: graduated from the Beijing University of Traditional Chinese Medicine and Pharmacology with a bachelor's degree in Chinese medicine
- 1985: obtained a Master's degree in Chinese medicines from the China Academy of Traditional Chinese Medicine
- 1992: obtained his Ph.D degree in Pharmacy from the Tokyo University of Pharmacy and Life Science in Japan
- 1989: commissioned by the World Health Organization as Main Editor of *Medicinal Plants in China*
- 1999: commissioned by The State Pharmacopoeia Commission of the People's Republic of China as Chief Editor of *A Colored Atlas of Microscopic Identification of Chinese Materia Medica in Powdered Form as Specified in Pharmacopoeia of the People's Republic of China.*
- 2003: commissioned by Eu Yan Sang (Hong Kong) Limited as Chief Editor of *An Illustrated Chinese Materia Medica in Hong Kong. (Chinese and English versions)*
- 2004: commissioned by Hong Kong Chinese Medicine Merchants Association as Chief Editor of *Hong Kong Commonly Confused Chinese Medicines.*

主编简介

赵中振教授,现任香港浸会大学中医药学院中药课程主任,兼任香港中医药管理委员会中药组委员,香港卫生署中药标准科学委员会委员,长期从事中药资源、品种与质量研究。

— 1982年在北京中医药大学获中医学学士学位。

— 1985年在中国中医研究院获中药学硕士学位。

— 1992年在日本东京药科大学获药学博士学位。

— 1989年受世界卫生组织委托主要负责编著《Medicinal Plants in China》。

— 1999年受中国药典委员会委托主编《中国药典中药显微鉴别图集》。

— 2003年受余仁生(香港)有限公司委托主编《香港中药材图鉴》(中、英文版)。

— 2005年受香港中药联商会委托主编《香港容易混淆中药》。

Editorial Committee

Special Thanks to Hong Kong Research Grant Council for subsiding some of the experiments of this book and, the valuable advice from Prof. Xu Luoshan

编辑委员会

鸣谢: 本书部分实验工作得到香港研究资助局资助,
徐珞珊教授提供宝贵意见。



Foreword 1

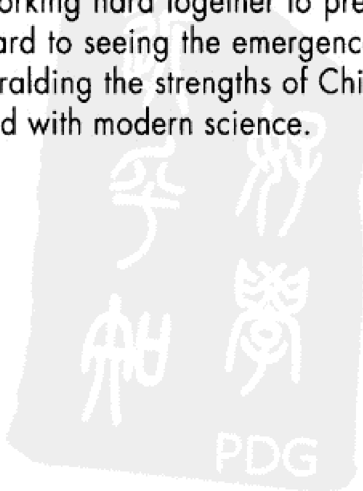
Authentication of Chinese Materia Medica (CMM) is the premise of the standardization and internationalization of Chinese medicine, and microscopic identification is the most essential part in the process of authentication.

It was heartening to learn that Prof. Zhao Zhongzhen of the School of Chinese Medicine of Hong Kong Baptist University intended to compile a publication on the identification of CMM and their various dosage forms, with special focus on microscopic manifestations. Prof. Zhao's plan happened to coincide with that of the International Society for Chinese Medicine (ISCM), an organization based in Macau, which was about to launch a series of high level academic monographs on Chinese medicine with a view to enhancing exchange among local and overseas scholars and researchers. The two parties 'clicked' instantly and joined hands to endeavor on the bold and forward-looking project of the compilation of "An Illustrated Microscopic Identification of Chinese Materia Medica", a publication of profound significance as well as practical value.

While ISCM provides financial support to the project, Prof. Zhao, being the Chief Editor, leads the editorial team composed of experts and experienced researchers, to conduct thorough microscopic identification for over 100 types of CMM. Applying modern technique of digital microphotography, the tissue sketch drawings, enlarged tissue and colored powder microscopic photographs for each species are clearly shown in the book, with comprehensive illustrations on the microscopic features as well as detailed bilingual elaborations.

The book fills up the gaps in the existing microscopic identification works on one hand, and helps to promote the standardization and internationalization of Chinese medicine on the other. It is also beneficial to the public by way of helping to enhance the quality and foster the proper use of CMM. People engaging in different aspects of Chinese medicine, such as quality control, production, trading, teaching, research and development, and enthusiasts of Chinese medicine alike will certainly find the book informative, helpful, interesting and worth owning.

I am pleased to see that the modernization and internationalization of Chinese medicine have made a further stride with the introduction of "An Illustrated Microscopic Identification of Chinese Materia Medica". Using scientific language and modernized techniques, Chinese medicine experts are all working hard together to preserve and demonstrate this traditional wisdom worldwide. We look forward to seeing the emergence of this traditional wisdom in the international arena and anticipate to heralding the strengths of Chinese medicine being brought into full play when it is thoroughly integrated with modern science.



Dr Daniel C.W. Tse
Chairman, The Chinese Medicine Council of Hong Kong
Chairman, The International Society for Chinese Medicine

序言一

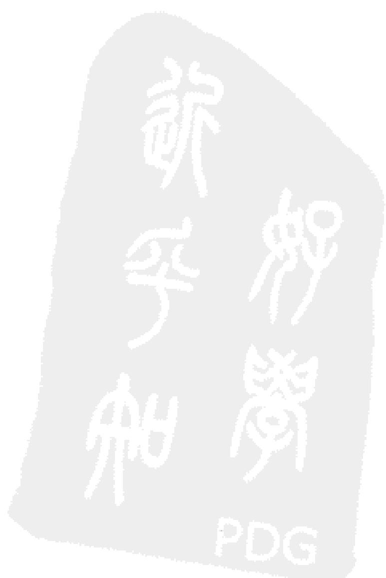
中药鉴定是中药标准化及国际化的前提,而中药显微鉴别则是中药鉴定重要的一环。

欣悉香港浸会大学中医药学院的赵中振教授有意编著一本从微观角度鉴别各类常用中药及其制剂的专著;适逢其会,设于澳门的国际中医药学会亦正准备出版一系列高水平的学术专辑,以供区内及海外的中医药专家学者参阅交流。于是,双方一拍即合,愿意共同为这本学术意义深远而实用价值浓厚的《中药显微鉴别图鉴》贡献一份力量。中医药学会作为组织者斥资出版图鉴,而赵中振教授作为主编统筹多位专家及科研人员,为超过100种常用的中药进行精密细致的显微鉴别工作。专家们采用先进的数码显微成像技术,将每个中药品种的组织墨线图、组织显微彩图、局部特征放大图和粉末显微彩图一一展示,全面精准而有系统地选取了中药材的微观特征,并以中英双语作详尽的图注说明。

《中药显微鉴别图鉴》不仅弥补了现有中药显微鉴定工作的不足,同时对中药显微鉴定技术的标准化以及对推动中药国际化起着重大作用。《中药显微鉴别图鉴》除具备重要学术价值外,对提高中药质量、保障市民用药安全以及开拓中药国际市场均具意义;亦是海内外从事中药检验、生产、贸易、教研的专业人士,动植物研究者和中药学爱好者珍贵而实用的参考工具书。

我很高兴透过《中药显微鉴别图鉴》,看见中医药在现代化和国际化的道路上又向前迈进了一步。从事中医药的研究工作的学者正运用最新科学技术和现代的语言向世界展示中医药这一有几千年传统的智慧结晶,我们期待中医药与现代科学顺利接轨,让世人能清楚看见和明白其博大精深之处,让中医药继续发挥其保健治病的功效,为人类健康做出贡献。

谢志伟博士
香港中医药管理委员会主席
国际中医药学会主席



Foreword 2

Traditional Chinese Medicine (TCM) is undergoing rapid globalisation; its current world market, estimated at US$ 722 million, is testament to this recent phenomemon. It was in the mid-1980s that TCM first caught the attention of the West in a significant way following successful TCM treatments in many Western countries for skin conditions, notably eczema and psoriasis. Western medicine has yet to find effective long-term solutions for these chronic conditions and it was in the wake of these clinical successes that numerous TCM clinics soon became established in many countries, notably UK, Germany, France, Netherlands, Spain, USA, Canada and Australia. Today, TCM clinics have a highly visible presence on the average British high street and numbers nationwide are thought to exceed 3,000.

The rapid growth in TCM worldwide has spawned many new TCM trading companies too, sourcing mainly from Hong Kong and the Chinese Mainland. While dried herbs ready for decoction (Yin Pian) continue to provide the bulk of herbs imported, increasingly granules and powdered extracts are proving increasingly popular. The speed at which these supply chains have become established to meet this rapidly expanding market has in the main, however, not been accompanied by rigorous herbal quality assurance systems. Traceability of herbs and their associated products are almost impossible to determine and, in the absence of reliable quality certification systems, the Western TCM market has suffered from exposure to Chinese herbs of highly variable identity and/or quality. This, coupled with lack of TCM practitioner regulation, has resulted in a spate of adverse reactions in the West, some serious. Essentially, the Western public has been put at risk by TCM outlets prescribing or selling TCM medicines of doubtful or potentially harmful quality.

Major efforts are now underway to fill these quality assurance gaps. Controls include new legislation such as the EU Traditional Herbal Medicinal Products Directive, approved suppliers schemes, mandatory training of herbal dispensers, provision of authentication resources, as well as the inclusion of TCM herbal monographs in national and regional Western pharmacopoeias. However, these all take time to become fully operational and what is hampering work in many areas is the lack of pharmacognosy skills. The loss of pharmacognosy as a mainstream discipline from many Western universities over the last 20 years has become a major constraint in the development of herbal quality assurance systems in the West. Prof. Zhao Zhongzhen's 'Illustrated Microscopic Identification of Chinese Materia Medica' represents a very significant contribution towards filling this acute knowledge gap.

With text in both Chinese and English, it provides detailed anatomical descriptions of some 126 of the most widely used TCM plant species. The presentation of each monograph is superbly designed. Each monograph is divided roughly into 4 parts: sketches of the crude drugs, photographs of sections of crude drugs, a description of characteristic plant tissues, and photographs of the cellular structure of the powdered drug. As one of the leading experts in the field of TCM microscopy, Prof. Zhao Zhongzhen's book makes available a wealth of knowledge that will undoubtedly prove invaluable to all those in the West concerned with the use of correct and unadulterated TCM herbs. Reliable anatomical texts in English for TCM herbs are in short supply. This volume provides a significant contribution to filling this gap and as such stands to benefit a wide audience: TCM suppliers, regulators, training colleges, natural product laboratories and other TCM researchers in the West. To Dr Zhao Zhongzhen and his colleagues, I would like to extend my heartfelt congratulations.

Christine Leon
Head, Chinese Medicinal Plants Authentication Centre
Royal Botanic Gardens, Kew
Richmond, Surrey, TW9 3AB

序言二

中医药正经历急促的全球化过程,传统中药于全球市场的总值约7亿2000万美元,中医药国际化现象方兴未艾。早在20世纪80年代中期,中医药在治疗湿疹和牛皮癣等皮肤病症上的卓越疗效,就引起西方国家注意。迄今,对于这些慢性疾病的治疗,西药仍束手无策。许多西方国家相继建立了大量的中医药诊所,尤其是英国、德国、法国、荷兰、西班牙、美国、加拿大和澳大利亚。如今,中医药诊所在英国已遍布街头巷尾,全英国的中医诊所数目估计超过3千家。

随着中医药在世界的兴起,应运而生了许多相关的贸易公司,他们的货源主要来自中国香港和中国大陆。虽然干燥药材饮片仍为输入的主体,但颗粒与粉末提取物已愈来愈得到大众的垂青。市场需求的迅速扩增带动货源供给网络的形成,但与之配套的严格中草药质量检测系统却没有迅速建立,对中草药及其相关产品仅靠简单的描述是不足以用于鉴定的。在中药制成品来源难以断定的情况下,西方中药市场承受了中药品种严重混淆与品质良莠不齐带来的苦果,中医药在西方的应用中出现了一些不良甚至负面反应,销售质量存疑甚或有害的中药销售商,使西方公众人士的生命受到威胁。

为了填补质量验证系统中的不足,有关方面正致力作出改善,其中中医规管包括立法程序,如《欧盟传统中药制品指南》、核准供货商计划、中药配药员的强制训练、提供正确的货源以及将传统中药专论加入全国和区内的西方药典中。这些规则的全面实施尚需要一定的时间,生药技能的缺乏不利于这项工作的进展。过去20年里,西方大学都没有把生药学作为主要学科,严重阻碍了西方中草药质量认证系统的建立。赵中振博士的《中药显微鉴别图鉴》为此做出了重大贡献,足以填补生药学科上的一大空白。

此专著以中英两种文字撰写,收录了126种常用中药材,精心设计加以详细的显微解剖学描述。每种药大致分为四个部分:原药材照片,药材组织简图,组织照片详图,药材粉末图。作为显微鉴定方面的专家,赵中振博士这本书无疑为西方社会所有关注真伪鉴别的人士提供了很大帮助,是一项难能可贵之举,丰富了中药材在显微鉴定学方面的英文数据,也有利于更多的读者来了解这方面的知识,中药供货商、管理者、培训学校、天然产物实验室以及其他的西方中药研究人士读过此书定会有所裨益。最后谨向赵中振博士和他的同事们致以衷心的祝贺。

Christine Leon
英国皇家植物公园
中药植物验证中心主任



Foreword 3

Microscopic Identification is one of the most significant measures of accreditation of the quality of Chinese medicine. With such features as high efficiency and great ease, it not only can be employed in accreditation of Chinese drugs, but also in that of Chinese patent medicine products. This verification measure has been successively adopted by "Pharmacopoeia of the People's Republic of China", "The Japanese Pharmacopoeia", "The Ayurvedic Pharmacopoeia of India" and "British Pharmacopoeia". The forthcoming publication of the "Hong Kong Standards of Chinese Materia Medica" also keeps an account of this measure and the corresponding standards. In this era of rapid development in chemical analysis, the microscopic identification is still a paramount verification technique which should be underscored as well as further developed.

Over the recent 20 years, Dr. Zhao Zhong Zhen has been making painstaking efforts in research of the microscopic identification of Chinese medicine. With insights in Chinese medicine and Chinese patent medicine, Dr. Zhao has made plenty of academic publications. In 1999, he was recruited by the Committee of Pharmacopoeia of the People's Republic of China as Chief Editor of the "A Colored Microscopic Atlas of the Powder Chinese Materia Medica Specified in Pharmacopoeia of the People's Republic of China". This time, the book, "An Illustrated Microscopic Identification of Chinese Materia Medica", is solely attributed to the contributions of a research team led by Dr. Zhao, in addition to the support by the Research Grants Council of Hong Kong, China throughout the past five years. This achievement can be acclaimed as a novel collection of identification experiences.

Macroscopically, several features of the book are as follows:

1. All statistics are exhaustive and authentic. All graphics and diagrams originate from the first-hand data of the experimental research. This is a scientific book dedicated to the restoration of experimental records as evidence.
2. All species and drugs recorded are correspondingly referenced. The approach of "From the Macroscopic to the Microscopic" is adopted for the use of cross-referencing by readers.
3. All pen-and-ink drawings, tissue diagrams and powder diagrams are incorporated together. With the application of the multi-color microscopic photographing technique, the principal microscopic identification features of Chinese drugs are genuinely and vividly recapitulated.
4. The contents are correspondingly referenced in English and Chinese. The descriptions are concise. It is for the ease of international communication.

Concerning the modernization and globalization of Chinese medicine, standardization serves as the foundation whereas the verification becomes the indispensable measure. "An Illustrated Microscopic Identification of Chinese Materia Medica" is another excellent masterpiece in the wake of the publication of its sister book in the arena of Chinese medicine identification, "An Illustrated Chinese Materia Medica in Hong Kong". The latter lays stress on the sources and description of the species whilst this book puts an emphasis on the microscopic identification. The publication of the above books with its dedication is also an innovative step forward by the School of Chinese Medicine, Baptist University of Hong Kong in the setting of a platform of pharmacognosy in Hong Kong, hoping to enhance the development of Chinese medicine.

For those working in the field of teaching, research, quality and quantity control as well as traders of Chinese medicine, this publication should be a reference book of practical values.

Delighted as I can read it ahead, I write this preface with the same delight.

Prof. Xiao Peigen
Academician
Chinese Academy of Engineering
People's Republic of China

序言三

显微鉴别法是鉴定中药真伪优劣的重要手段之一,具有快速、简便的特点,不但适用于中药材,同时也适用于部分中成药制品。这一检测方法,先后被《中国药典》、《日本药局方》、《印度草药典》、《英国草药典》等采用,刚出版的《香港中药材标准》也收录了这一方法与相应标准。在化学分析飞速发展的今天,显微鉴别仍然是一项不可忽视并有待发展的重要检测技术。

赵中振博士近20年来潜心从事中药显微鉴别研究,在中药与中成药方面颇有心得,发表了众多学术论文,1999年他还曾被中国药典委员会聘请主编《中华人民共和国药典中药粉末显微鉴别彩色图集》。这本《中药显微鉴别图鉴》主要是他领导的研究组,过去5年在香港研究资助局(RGC)的支持下完成的,可谓新的显微鉴别经验集成。

纵观《中药显微鉴别图鉴》有以下几个特点:

1. 全书数据翔实,所有图像均为实验研究的第一手资料,是一部以实验制片为依据的科学专著。
2. 全书所收品种均与药材相互参照,从宏观到微观,便于读者应用。
3. 全书将墨线图、组织详图与粉末图相结合,应用彩色显微摄影技术,真实、生动地再现了中药材的主要显微鉴别特征。
4. 中英双语对照,文字说明扼要,便于国际交流。

谈及中药的现代化与国际化,标准化是基础,检测则是必要的措施。《中药显微鉴别图鉴》是在《香港中药材图鉴》之后的又一佳作,两书在中药鉴别方面堪称姊妹篇,《香港中药材图鉴》重在基原与性状鉴定,本书重在显微鉴别。以上专著的出版也是香港浸会大学中医药学院在构筑香港生药技术平台,促进中医药学发展方面又迈出的新的一步。

本书对于从事中药教学、研究、质量检验和中药贸易人员来说,均不失为一部实用的参考书。

先睹欣喜之余,乐为之序。



肖培根

中国工程院院士

A guide to the use of this book

1. This publication documents 126 items of commonly used Chinese Materia Medica (CMM). The selection is based on the circulation of CMM in the market today, from the main species in the An Illustrated Chinese Materia Medica in Hong Kong and the 2005 edition of the Pharmacopoeia of the People's Republic of China (C.P.). However, one representative species is documented as to those Chinese Materia Medica with multiple sources.

2. The entries of this publication are arranged according to the alphabetical order of Latin names of CMM. Besides, Pin Yin index,Chinese name index and Latin name index of sources are also included in the appendix.

3. For each documented CMM, the information given generally includes:
   i. Name: including Latin name, Chinese common name and Pin Yin of Chinese common name;
   ii. Source: including the family name, the species name and the part used for medicinal purposes;
   iii. Photographs of the CMM;
   iv. Sketch of the transverse section;
   v. Detailed photographs of the transverse section;
   vi. Main powder characteristics;
   vii. Explanatory notes.

4. As the main microscopic characteristics photographs which are useful for identification are documented in this publication, surface view pictures of 11 CMM species were documented instead of their transverse section photographs. The explanatory notes attached are referred to Xu Guojun's Microscopic Identification of Unprocessed Chinese Drugs (published in 1986) and Zhao Dawen's Chinese Medicinal Materials Illustration for Morphology, Histology and Powder (published in 1998).

5. All the photographs printed in this publication are of authenticated CMM well observed and shot through experiments. Every group of transverse section pictures includes a sketch and a detailed photograph. Sketches are pen-and-ink drawings with the tissues' names labeled beside, showing the distribution and arrangement of different tissues; while the detailed photographs are digital ones with serial numbers from top down, showing the microscopic characteristics. The powder photographs only include the main microscopic characteristics and are arranged according to the importance of the characteristics. "A" and "B" represent the observation results under bright microscope and polarizing microscope respectively.

6. The magnification of each photograph in this publication is specified with a measuring scale and the content is compiled according to the original data in the experiments. All the photographed items are kept in the HKBU Bank of China (Hong Kong) Chinese Medicines Centre, School of Chinese Medicine, Hong Kong Baptist University.

7. The measurement units adopted in this publication are official and universally adopted. For example, miters (m), centimeters (cm) and millimeters (mm) are used to describe the length of the CMM. Micrometer (μm) is used to describe the photographs of the transverse section and powder characteristics.

编写说明

1. 本书共收载常用中药材126种。在对现今中药材市场实际流通情况的调查基础上,选录了《香港中药材图鉴》和《中华人民共和国药典》(以下简称《中国药典》)2005版中的部分品种。

2. 本书按照药材拉丁名的顺序编排。附有药材中文名称、汉语拼音名称及原植物拉丁名索引。

3. 每种中药材收录的主要内容有:

   i. 名称,包括药材拉丁名、中文名、汉语拼音名;

   ii. 基原,包括植物科名、学名及药用部位;

   iii. 原药材照片;

   iv. 药材横切面简图;

   v. 药材横切面组织详图;

   vi. 药材粉末特征图;

   vii. 图注说明。

4. 本书按照药材特点收录了主要的有鉴别意义的显微特征图,其中11种药材因为不适宜做横切面片观察,编者收录了其表面片的特征图。图注说明中的文字同时参照了《中药材粉末显微鉴定》(徐国钧主编,1986)、《中药材外形组织粉末图解》(赵达文主编,1998)中有关内容。

5. 本书收录的所有照片,均来源于鉴定准确的药材,经实验观察,拍摄所得。横切面组织图均包括简图与详图两部分。组织简图为墨线图,用以表示各类组织的分布和排列顺序,各组织名称直接标注于图旁;组织详图为数码照相的显微照片,显示显微特征,编号基本按自上而下的顺序排列。粉末照片收录了主要的鉴别特征,标号按特征主次顺序排列,"A" "B"分别表示在明视野显微镜与偏光显微镜下的观察结果。

6. 本书中所有照片均附有比例尺,所载内容均为实验原始资料。全部药材标本及实验样品均保存于香港浸会大学中国银行(香港)中药标本中心。

7. 本书所用的计量单位均为法定计量单位,以国际通用单位符号表示,组织详图与粉末照片均以50μm或100μm墨线表示。



Standard Operation Procedure (SOP)

(VCD is attached)

Microscopic Identification is an important method to determine the authenticity and quality of Chinese Materia Medica (CMM). This method makes use of microscope to identify crude drug slides of transverse or longitudinal sections, powder, surface and disintegrated tissue and patent medicines slides. The main characteristic is quick and accurate.

I. Making Specimen Slides of CMM

1. Sampling

The validity of sampling would directly affect the accuracy of identification results; therefore the procedures of sampling should be followed in detail. Samples are mainly from reference samples (R.S.) and test samples (T.S.).

R.S., with reference to T.S., is essential for microscopic identification. The standard R.S. should be used after strict botanical taxonomy identification with the original plant for reference. Apart from accurately identifying the original plants of CMM, it should be noted that the microscopic features of the test object might show variation by growth period and environment. Therefore the productive place, collection time and processing methods should be recorded.

For T.S., origins, place of production, specification, grade, packaging style should be noted, and integrality of package, hygienic level, water trace, extent of being mildewed and rotten and polluted by other materials should be also checked and recorded in detail.

The average quantity of samples should be no less than 3 times as required for test, as 1/3 of the sample is taken for experimental analysis, 1/3 for verification while the other 1/3 is retained for at least a year.

2. Making Specimen Slides

Quality of tissue slides is essential to microscopic identification. Methods of making specimen slides should be chosen according to the nature of test object. There are four main methods including bare hand mounting, gliding mounting, cryology mounting and paraffin mounting.

2.1 Bare Hand Mounting

This method is mainly for making temporary slides. It takes the advantages of convenience, quickness and practicality, but the proper thickness of slides is difficult to master. General procedures are as follows: use three left fingers to fix the material; hold a blade with right hand; put the blade against the material and slice smoothly from the left outward to the right inward. Avoid front and back cutting and keep lubricating the blade with water.

It is also commonly used for slides of surface by tearing bare-handedly.

中药显微鉴别操作规程(SOP)

(附光盘)

中药显微鉴别是鉴别中药材真伪、优劣的方法之一。此法一般指借助于显微镜对药材的切片、粉末、解离组织或表面制片及成方制剂进行鉴别,具有快速、准确的特点。

一、中药材组织制片

1. 取样

取样的可靠性直接影响到结果判断的准确性,因此必须重视取样的各个环节。样品主要来自对照品和供试品。

对照品是检定供试品的参照物,其制备是显微鉴别的先决条件。经过严格的植物分类学鉴定后有原植物标本对照的方可作为标准对照品。在鉴定好中药材基原的同时,还应注意有些药材的显微特征受生长条件的限制及环境的影响,会产生一定的变化,所以对于供试品的产地、采收期、加工方法等也应当认真记录。

供试品要注意原药材的基原、产地、规格、等级及包件式样,检查包装的完整性、清洁程度以及有无水迹、霉变或其他物质污染等情况,并详细记录。

平均样品的收集量不少于测试样品的3倍,其中1/3用作测试，另1/3用作复核，最后1/3则为留样保存，保存期限至少1年。

2. 制片

高质量的切片是鉴定的基础。根据鉴别的对象不同,可选用徒手制片法、滑走制片法、冰冻制片法和石蜡制片法等方法。

2.1 徒手制片法

主要用于临时制片。本法简便、迅速、实用,但切片厚薄不易掌握。具体操作方法如下:左手3只手指固定材料,右手持刀,刀口轻接材料,自左前方缓慢向右后方下滑,注意不可前后拉割,刀面要不断加水润滑。

表面片的制作常用徒手撕片法。



2.2 Gliding Mounting

This method is suitable for lignum, ligneous roots, stems or some other solid materials. The slides could be complete but not continuous. Gliding mounting machine is directly used in slicing and the thickness of slides could be adjusted well.

2.3 Cryology Mounting

Mainly used in slides of animal tissue, fresh and young plant tissue. The steps are as follows:

i) Preparation of samples: Cut the sample; embed them with cryomatrix on a crycasste.

ii) Freezing of samples: Place the crycasste with embedded specimen on the peltier in the freezing chamber for some time until the cryomatrix is solidified.

iii) Specimen sliding: Transfer the crycasste on the specimen head and held by a specimen clamp. Then, adjust the position and angle of blade and anti-roll plate and select proper forward distance. Choose manual or automatic mode to slice.

iv) Specimen mounting: use a brush to transfer the slide sheet onto a clean slide carefully. Adjust the position and flatten the specimen.

v) Slide sealing: Take the mounted slides out of chamber. Seal the slide after the defrost of cryomatrix. Then label the slides with name, serial number and date before storing.

2.4 Paraffin Mounting

Paraffin slicing is the method that acquired paraffin as an invading agent. The steps are as follows:

i) Sampling: Cut the chosen materials into cubes of 0.5~1.0 cm^3

ii) Immobilization: Immobilize the materials with fixation reagents (e.g. FAA) to kill the bio-plasm and maintain the fine tissue so that it will be suitable for slicing.

iii) Rinsing: Rinse with 50% ethanol for 2-3 times to get rid of deposit and the fixation re-agent in the material.

iv) Dehydration: Replace the water in the tissues by low to high gradient concentration of ethanol.

v) Vitrification: Use vitrification agent (e.g.xylene) to replace ethanol gradiently from low to high concentration.

vi) Olefin immersion: Load scraps of paraffin into bottles with xylene. Place the bottles into an oven with temperature of little higher than the melting point of paraffin for over 6 hours. Replace paraffin 2~3 times to ensure paraffin is completely immersed.

2.2 滑走制片法

适用于切制木材、木质的根和茎等坚硬材料,切片完整,但是不能做连续切片。其方法是用滑走切片机直接进行切片,滑走切片机能按需要调节切片的厚度。

2.3 冰冻制片法

主要用于动物药、新鲜的植物药或幼嫩组织的切片,其步骤如下:

1) 样品准备:把所需要的样品放在载物台上,加冷冻液至将样品全部覆盖;

2) 样品冰冻:把载物台放在切片机的冷冻台上3~5min,直至冷冻;

3) 样品切片:把样本载物台放在切片机的载物夹上,调整刀片及防卷板位置、角度,按需要调整切片的厚度,可选择手动或自动切片;

4) 装片:用毛笔把样本放在载玻片上,调整位置使样本平整;

5) 封片:把载玻片从切片机的冷冻室中取出,待冷冻液解冻后封片,然后标记名称、号码和日期,贴上标签后保存。

2.4 石蜡制片法

是以石蜡作为支持剂的切片方法。其主要步骤如下:

1) 取材:把需要的材料切成0.5~1.0cm^3小块;

2) 固定:用固定液(如:FAA)固定材料,以杀死原生质和保持微细结构,便于切片;

3) 冲洗:用50%的乙醇冲洗2~3次,洗去沉淀物和固定液;

4) 脱水:用乙醇由低至高浓度逐级进行,除去组织中的水分;

5) 透明:用透明剂(如:二甲苯)由低至高浓度逐级进行;

6) 浸蜡:将组织材料放在适当大小的试管中,加入适量纯二甲苯,再加入碎石蜡,然后放在60℃左右的烘箱中6h取出,逐步转换2~3次至纯石蜡,使石蜡完全取代透明剂;



vii) Olefin embedding: Pour some melted paraffin into a paper box and place pretreated materials in order. Cool down to coagulated paraffin.

vii) Slicing: Cut the coagulated paraffin into small cubes. Stick the small cube onto a small wooden block mounted on microtone with blade. Adjust the position of the materials and the blade. Then start slicing.

ix) Gluing slide pieces: separate the slides of paraffin pieces and transfer them to clean slides. Load the pieces to a warm plate and dry them in an oven for over 24 hours.

x) Dissolvetion: Dissolve the paraffin completely by immersing the slide in xylene for 5-10 minutes.

xi) Dyeing: The ethanol solution of safranin and fast green are commonly used in dye progressing such as duplex dyeing. (The dyeing of all samples in this book is applied with this method.)

xii) Vitrification: replace the dyeing solution with a low to high gradient concentration of ethanol following by subsequence placement of ethanol to vitrification agent.

xiii) Sealing: sealing the mounted specimen with arabic gum or neutral gum. Label the specimen with name, serial number and date.

II. Sampling and slicing of CMM powder

1. Sampling

The content of reference and test samples can be referred to sampling item of making specimen slides of CMM in part I.

2. Pretreating

The cleaned CMM is blended into powder. Make sure the powder pass through sieve no. 4 (as specified in the China Pharmacopoeia) to obtain fine granules.

3. Slicing

Place the pretreated material on the slides. Then add 1-3 drops of testing agents on them by stirring. Next, use forceps to put the cover on the slide by one side delicately. Absorb the excess liquid by filter paper if any. At last, Label the specimen with name, serial number and date.

III. The Use of Microscope

Microscopic Identification is the method to observe the detailed size, shape and ergastic substance of cells and tissue structures by a microscope so that the identification characteristics are clearly shown. In order to reflect the accurate microscopic features, a good mastery of using the microscope and skills of photographing are very important. The procedures are as follows:

7) 包埋: 把溶化后的石蜡倒进预备的特制纸盒中,放入处理好的材料,排好位置,待石蜡冷却凝固;

8) 切片: 常用的切片方法有旋转切片法和滑走切片法,其主要步骤是:分割石蜡块,粘在小木块上,固定在切片机上,调整好材料和刀片位置及切片厚度后即可进行切片;

9) 粘片: 分割蜡带,在洁净的载玻片上加粘贴剂和蒸馏水,把蜡片移至载玻片上,在温台上使蜡片展平,放入烘箱中24h,直至干燥;

10)脱蜡: 用石蜡溶剂将蜡片上的石蜡完全溶解除去;

11)染色: 常用番红(safranin)、固绿(fast green)的乙醇溶液作为染料,进行二重染色(本书中样品染色均采用此方法);

12)透明: 经各级乙醇脱水后再到透明剂中透明;

13)封片: 用阿拉伯胶或中性树胶封固,然后标记名称、编码和日期,贴上标签。

二、中药粉末的取样与制片

1. 取样

对照品与供试品的取样参见中药材组织制片的项下介绍。

2. 前处理

样品捡净后,用研钵或小型电磨粉碎,过四号筛(《中国药典》)。

3. 制片

将处理后的样品置于载玻片上,然后加入适宜的试液1~3滴,搅匀,用镊子将盖玻片沿一侧轻轻放下,可用滤纸吸拭溢出的液体。标记编码和日期,贴上标签。

三、显微镜的使用

显微鉴定主要是利用显微镜观察植(动)物药材内部的细胞形态、组织构造及细胞后含物,明确显微特征,达到鉴定目的。为真实反映中药材的显微鉴别特征,掌握显微镜的使用方法及显微摄影技术是十分重要的。主要步骤:



i) Place the specimen slide onto the stage;

ii) Turn on the power and check the lamp adjustment;

iii) Select the proper eyepiece and objective;

iv) Adjust the focal distance and observe the specimen.

1. Light Microscope

The basic principle and general structures of microscope are as follows:

1.1 Principle

The balance light coming from the source goes into condenser after being reflected, and then focus on the specimen to highlight it. A magnified, upside down and real image is then formed by this beam of light through the anterior focus to posterior focus of objective on the focal plane of eyepiece. The secondly magnified upright apparent image, i.e. the virtual image of ours, will be formed in the sight distance in front of the microscope. After being magnified twice by the eyepiece and objective, observers could therefore see the microscopic structures of specimen clearly. Magnification of objective (Mob) is equal to the focus divided by the length of tube; and magnification of eyepiece (Meye) is equal to the focus divided sight distance. As a result, the total magnification is the product of multiplication of Mob and Meye.

Total magnification of the microscope = Mob x Meye

1.2 Structure

Light microscope basically consists of the mechanic part and optical part.

1.2.1 Mechanic Part

Base, arm, stage, objective, eyepiece and focus adjusting assembly are mainly included. Fig. 1 is the polaring microscope used in the lab, which is just more assembled with analyser and polarizer, comparing to the bright field microscope.

1) 将切片置于载物台上;
2) 开启电源,调节光亮度;
3) 选择目镜和物镜;
4) 调节焦距,观察材料。

一般情况下是先在低倍物镜下观察,然后再置于高倍物镜下观察。

1. 光学显微镜

显微镜的基本原理及大致构造如下:

1.1 原理

光源的平衡光到达反光镜,由反光镜反射进入聚光器,经聚光镜聚焦照明标本,这股光线经物镜前焦点进入物镜,再经后焦点,向上散开构成第一次放大的倒立实像;此像投落在目镜前焦平面,进入目镜后再构成第二次放大的正立虚像,落在显微镜前面视距的地方,即为人眼所看到的物像。经过目镜和物镜的两次放大后,观察者可以清楚地看到物体的细微结构。物镜的放大倍数为物镜的焦距除光学筒长,目镜的放大倍数为目镜的焦距除视距,总倍数为两者的积。

公式:物镜的倍数 × 目镜的倍数=放大倍数

1.2 构造

光学显微镜主要由机械部分与光学部分组成。

1.2.1 机械部分

主要包括镜座、镜臂、载物台、物镜、目镜、焦距调节装置等。图1所示为本实验室所用的偏光显微镜,比普通显微镜增加了4号、10号装置。



Fig. 1 The structure of microscope
1. camera 2. eyepiece 3. beam splitter switch rod 4.analyser 5. objective nosepiece 6. objective 7. stage with clips 8. condenser 9. focusing wheel 10. polarizer 11. field diaphragm 12. base

图1 显微镜的构造
1. 相机 2. 目镜 3. 检视转换器 4. 检偏片 5. 物镜转换器 6. 物镜 7. 载物台 8. 聚光器 9.焦距调节器 10. 起偏片 11. 场光阑 12. 镜座

1.2.2 Optical Part

Besides a serial of magnifying lens in major, there are also optical density adjuster, filter and light source.

i) Objective

Objective is the most important assembly to determine the performance of a microscope. It consists of several groups of compound lens. The longer the tube is, the larger the number of lens group is. Generally speaking, the one whose magnification is higher than 40 times is called "high-power objective"; if the Mob is lower than 10, it is called a "low-power objective". Sometimes, cedar oil or some other particular infiltrating oil is used as a kind of cating filled between specimen and objective to avoid light scattering and diffusion, and the magnification is up to about 100 times as a result.

ii) Eyepiece

A group of lens, whose magnifications are relatively smaller, is assembled in eyepiece with the function of magnifying the image from the objective further. However, the resolution of the image will not be made better by this way. Meye is engraved on the surface of each eyepiece, such as 5x, 10x, 20x, etc.

iii) Optical density adjuster

a. Condenser: consisting of several lens beneath the stage, to focus the beam onto specimen.

b. Field diaphragm: above the light source, to regulate the amount of light reaching the objective lens by reducing the reflection.

2. Polarizing microscope

2.1 Principle

Compared with the bright field microscope, the polarizing microscope makes use of the characteristics of anisotropic hyalosome that it will form a polarized light beam when nature light permeates. By this characteristic, the anisotropic materials such as starch, crystal, etc. can be clearly observed under a dark sight field. To observe the identification features of CMM is thereby just like looking for the stars in the dark sky.

2.2 Structure

The assembly of polarizing microscope is quite simple, not another high-level microscope, but just with a polarized set assembled, which includes two Nicol Prism or two pieces of artifical polarizer.

1.2.2 光学部分

主要由一系列的放大镜组合而成。除了主要用于放大的透镜组外,尚有光密度调节装置、滤光片、光源装置等。

1) 物镜

物镜是决定显微镜性能的最重要部分,内置多组复式透镜。镜筒越长,透镜组数越多,放大率则越大。一般放大率在10倍以下者,被称为“低倍物镜”。放大率在40倍以上者,称为“高倍物镜”。为防止散射、漫射,在物镜与标本间选用香柏油或特别浸润油作为介质进行观察时,被称为“油镜”,放大率一般在100倍。

2) 目镜

内装有一组放大率较小的透镜。其作用在于将物镜所成图像作进一步的放大。就分辨力而言,目镜不能提高图像的质量。目镜表面都刻有放大率,如5x、10x、20x等。

3) 光密度调节装置

a. 聚光器:由数片透镜组成,位于载物台下方,用于将光线集中到所要观察的标本上。

b. 场光阑:位于光源的上方,主要功能是靠减少物镜反射光斑来控制图像的光。

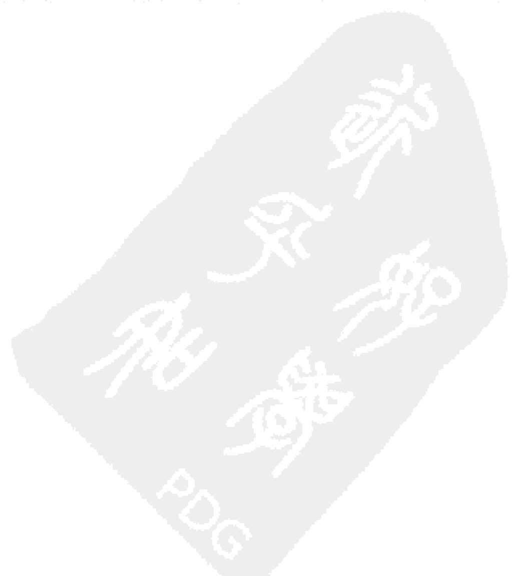
2. 偏光显微镜

2.1 原理

偏振光显微镜 (polarizing microscope) 简称偏光显微镜。与普通的明视野显微镜相比,偏光显微镜利用了自然光在通过各向异性透明体时,可产生偏振光的作用原理,在黑暗视野下,清晰地观察各向异性物质,如淀粉、晶体等,从而观察中药的鉴别特征好似黑夜在天空中寻找星星一样。

2.2 构造

偏光显微镜配件简单,无需重新购置高档显微镜,只要在现有的显微镜上增加一套偏光装置即两个尼科尔棱镜 (Nicol Prism) 或两块人造偏振片即可。



2.3 Characteristic and suitable objects

Polarizing microscope was usually used to observe the starch and crystal in the past. However, it is reported that most of plant, animal or mineral drug powders also show the phenomenon of polarization more or less. As a result, the technique of microscope identification of CMM powder will be applied to more fields.

3. Microscopic photographing

With the combination of microscopic photographing and image handling technique, it is more and more convenient to use and save the suitable pictures. There are different operation guide for different software, but mainly including the functions of exposure time adjusting, contrast adjusting, crop selection, microscopic measuring and so on.

IV. The main characteristics in tissue and powder of CMM

	Tissue	Powder
Root and rhizome	Dicotyledon: cork, cortex, phloem, cambium, xylem, pith Monocotyledon: epidermis, cortex, stele, pith, scattered vascular bundles in stele	cell ergastic substance (starch grain, inulin, crystal), secretary tissue, sclerenchyma (fiber, stone cell); vessel, cork, metaderm, epidermis and hypodermis
Cortex	sclerenchymatous cell, cork	cork, fiber, stone cell, ray cell, sieve tube
Wood *	vessel, fiber, xylem parenchymatous cell, trend of the ray	vessel, xylem fiber, xylem parenchymatous cell, xylem ray cell
Ratan	Visible in cortex and wood	Visible in cortex and wood
Leave *	mesophyll, stoma, epidermis, midrib	epidermis cell, stoma, hair (glandular hair, non-glandular hair), crystal
Flower *	pollen grain, hair, stamen and pistil	pollen grain (shape, size, characteristics of outer wall, aperture), inner wall of pollen sac, hair
Fruit	the structure of exocarp, mesocarp, endocarp	cells of exocarp, mesocarp, endocarp
Seed	different layers of the seed-coat, perisperm	sclerenchymatous cell, seed-coat cell, endopleura goblet cell, stone cell, oil cell
Herb	including the characteristics of different parts of the plant	including the characteristics of different parts of the plant
Fungus *		hypha (shape, branched, color, size), aggregated masses, spore, crystal
Animals *		skin fragment, myolin, chaeta, body wall fragment, bone fragment, squama
Minerals *		shape of crystal, transparence and texture on the surface

* For Wood, transverse section, longitudinal section and radial section are observed
* For folium, sometimes only surface view is observed
* For flower, only surface view and powder characteristics are observed
* For fungus, only powder characteristics are observed
* For animals and minerals, only the physical appearance and powder characteristics are observed

2.3 特点与适用对象

偏光显微镜以往多用于淀粉和晶体物质的观察。近期研究表明,大多数植物、动物、矿物类的药材粉末,也可在偏光下不同程度地反映出“各向异性”的性质。因此,利用此种特征,可拓宽中药粉末显微鉴别的应用范围。

3. 显微摄影

现今,通常将显微镜和计算机图像处理技术相结合,使得图像更方便使用和储存。不同计算机软件有不同使用方法,主要都有曝光时间调节、对比度调节、范围选取和显微测量等功能。

四、中药材组织和粉末的主要观察特征

	组织片	粉末片
根及根茎类	双子叶植物:木栓层、皮层、韧皮部、形成层、木质部、髓部 单子叶植物:表皮、皮层、中柱、中央髓部、中柱维管中散生	细胞后含物(淀粉粒、菊糖、结晶)、分泌组织、厚壁组织(纤维、石细胞)、导管、木栓组织、后生皮层、表皮及下皮
皮类	厚壁细胞、木栓组织	木栓组织、纤维、石细胞、射线细胞、筛管
木类※	导管、纤维、木薄壁细胞、射线走向	导管、木纤维、木薄壁细胞、木射线细胞
藤茎类	皮类和木类药材的特征均可察见	皮类和木类药材的特征均可察见
叶类※	叶肉组织:气孔、表皮、叶肉、中脉	表皮细胞、气孔、毛茸(腺毛、非腺毛)、晶体
花类※	花粉粒、毛茸、花蕊	花粉粒(形状、大小、外壁特征、萌发孔)、花粉囊内壁、毛茸
果实类	外果皮、中果皮、内果皮的结构	外果皮、中果皮、内果皮的细胞
种子类	种皮及其各层结构、胚乳	厚壁细胞、种皮细胞、内种皮杯状细胞、石细胞、油细胞
全草类	包括植物的各个部分特征	包括植物的各个部分特征
菌类※		菌丝(形状、有无分枝、颜色、大小)、团块、孢子、结晶
动物类※		皮肤碎片、肌纤维、刚毛、体壁碎片、骨碎片、鳞片
矿物类※		晶体的形状、透明度和表面纹理

※ 木类药材要观察其横切片、纵切片和径向切片。
※ 叶类药材可做表面片。
※ 花类药材通常只做表面片和粉末片。
※ 菌类药材通常只做粉末片作观察。
※ 动物类药材一般只观察其性状和粉末片。
※ 矿物类药材一般观察外形和粉末片。

V. Main Points of Sketch

1. Features of the sketch

The sketch can clearly show the structure and its proportion of different parts of plants tissues.

2. Requirement and procedures of drawing

i) Choose the typical materials correctly and observe the specimen seriously to ensure a scientific and accurate drawing.

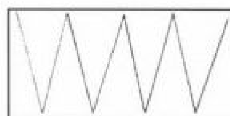
ii) Composing Arrange the position and correlation ratio of different parts of the tissue on the paper; leave a space for the title and label.

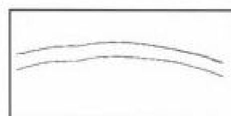
iii) Drawing Firstly use pencil to sketch the draft, then use a standard drawing pen to figure out the details by using the right lineation. The line of drawings should be even, smooth and clear, with no furcation at the junction and no replotting.

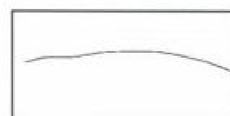
iv) To be familiar with the different signs of lineation and symbols to demonstrate the structure and distribution of different tissues.

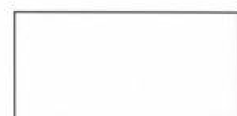
v) State the title and explanatory note and indicate the magnification.

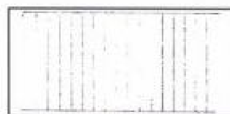
3. Illustration


cork

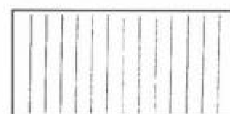

epidermis

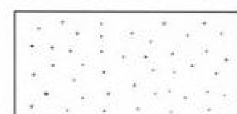

epidermis

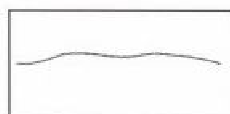

xylem/pith/spongy tissue

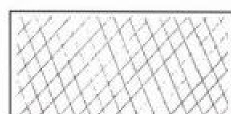

xylem


xylem/vessel


palisade tissue

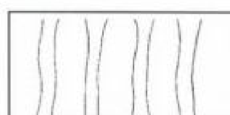

phloem


cambium


fiber bundle


fiber bundle

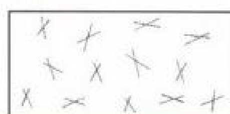

leaf/root trace vascular


ray


cleft

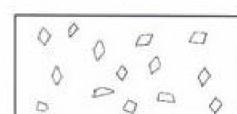

oil cavity/secretary canal

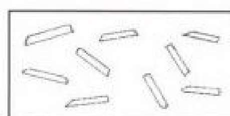

sieve tube/lactifer

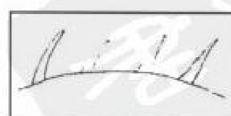

cluster crystal


raphid crystal

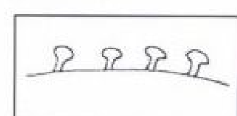

sandy crystal


prism crystal


columnar crystal


non-glandular hair


glandular hair


glandular hair

五、墨线图绘图要点

1. 简图的特点

简图能清晰明了地显示植物组织各部分的结构及其比例。

2. 绘制要求和步骤

1) 正确选择典型材料,认真观察切片样品,以保证绘图的科学性和准确性。

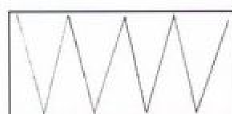
2) 构图　在图纸上安排好各图的位置和相关比例,并留出书写图题和标注的地方。

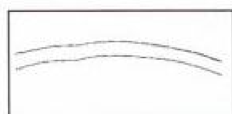
3) 绘图　先用铅笔绘制草图，然后用标准绘图笔描出与观察对象相吻合的线条。要求线条粗细均匀、光滑清晰、接头处无分叉，忌重复描绘。

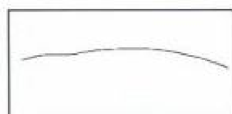
4) 熟悉用不同的画线方式和符号来表示不同的组织结构与分布。

5) 写明图题和图注,标明放大倍数。

3. 图例

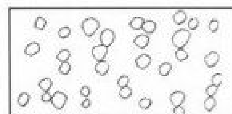

木栓层

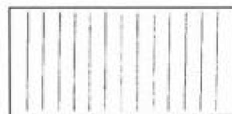

表皮

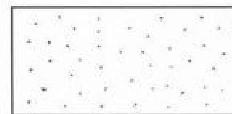

表皮

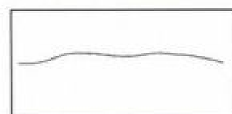

皮层/髓/海绵组织


木质部

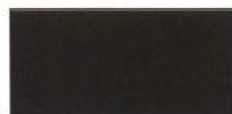

木质部/导管

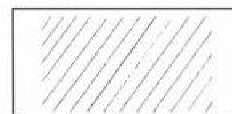

栅栏组织

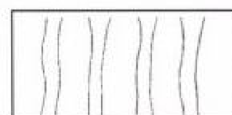

韧皮部

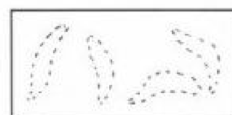

形成层

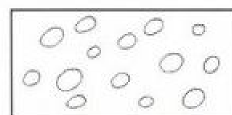

纤维束

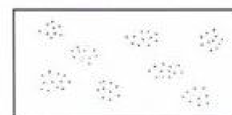

纤维束


叶迹/根迹维管束


射线


裂隙

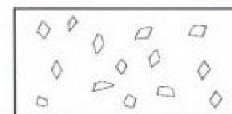

油室/分泌导

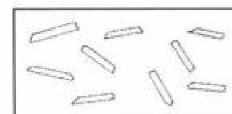

筛管群/乳汁管群


簇晶


针晶

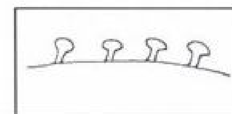

砂晶


方晶


柱晶


非腺毛


腺毛


腺毛

VI. The Application of Microscopic Identification

Microscopic identification has an extensive application on the identification of CMM for confused drug, fake drug and Chinese Patent Medicines (CPM). The use of polarized technical ensures a more accurate and quick identification result, which further expand the application. The followings are some of the examples.

1. Identification of confused and counterfeit drug

[Example 1] Identification of Cordyceps sinensis and its counterfeits [2]

Cordyceps consists of the stroma of the fungus, Cordyceps sinensis (Berk.) Sacc. (Fam. Hypocreaceae), parasitized on the larva of some species of insects and the dead caterpillar. The seta on the body of polypides is one of its unique biological features, which can be observed under microscope. The microscopic features of Cordyceps sinensis and its seven counterfeits are compared in the following figures. (See Fig.2 and Fig.3)

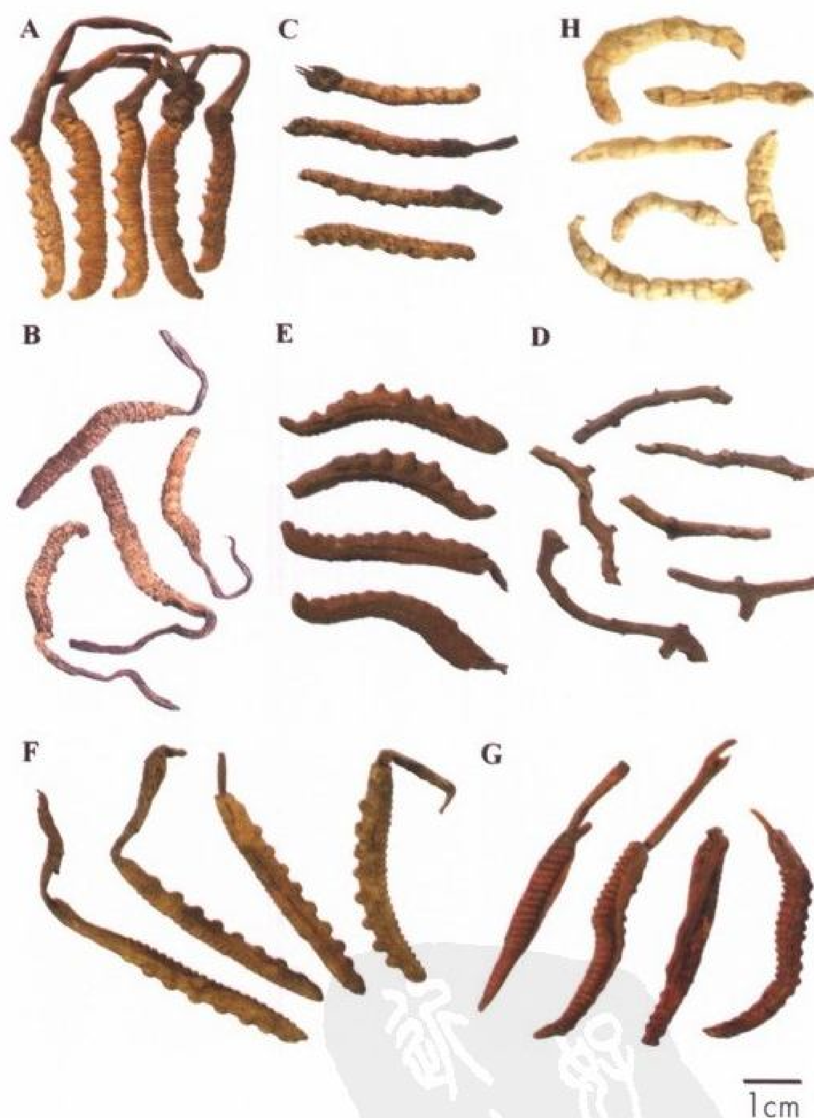


Fig. 2 Raw medicinal materials of Cordyceps sinensis and that of its seven counterfeits

A. Cordyceps sinensis B. Cordyceps hawkesii C. Counterfeit forged by Dendrolimus spp. adhered with Hemerocallis spp. D. Polypodiods nipponica E - G. Counterfeit forged by starch H. Stachys sieboldii

六、显微鉴别技术的应用

中药显微鉴别技术在中药材混淆品、伪品及中成药的鉴别方面有着广泛的应用。偏光技术的利用使得鉴别更加准确、迅速,为其进一步拓展了应用空间。现举例说明如下:

1. 混淆品与伪品的鉴别

[实例1]　冬虫夏草的鉴别[2]

冬虫夏草,其正品应为Cordyceps sinensis (Berk.) Sacc.,以其刚毛为主要的显微鉴别特征,与7种伪品作比较,得到如下结果(见图2、图3):

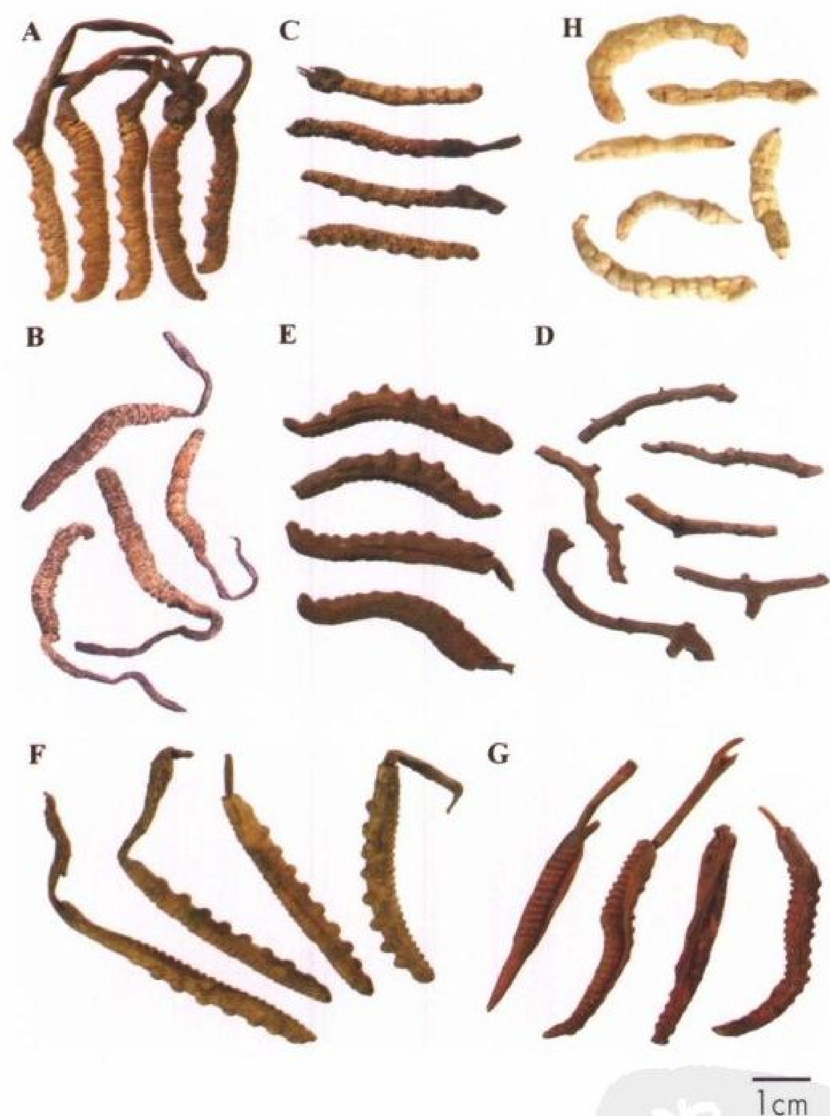


图2　冬虫夏草和其7种伪品的生药鉴别

A.冬虫夏草 Cordyceps sinensis　B.亚香棒虫草Cordyceps hawkesii　C. 松毛虫粘结黄花菜伪品Counterfeit forged by Dendrolimus spp. adhered with Hemerocallis spp.
D. 石蚕Polypodiods nipponica　E ~ G. 淀粉伪品Counterfeit forged by starch
H.草石蚕 Stachys sieboldii

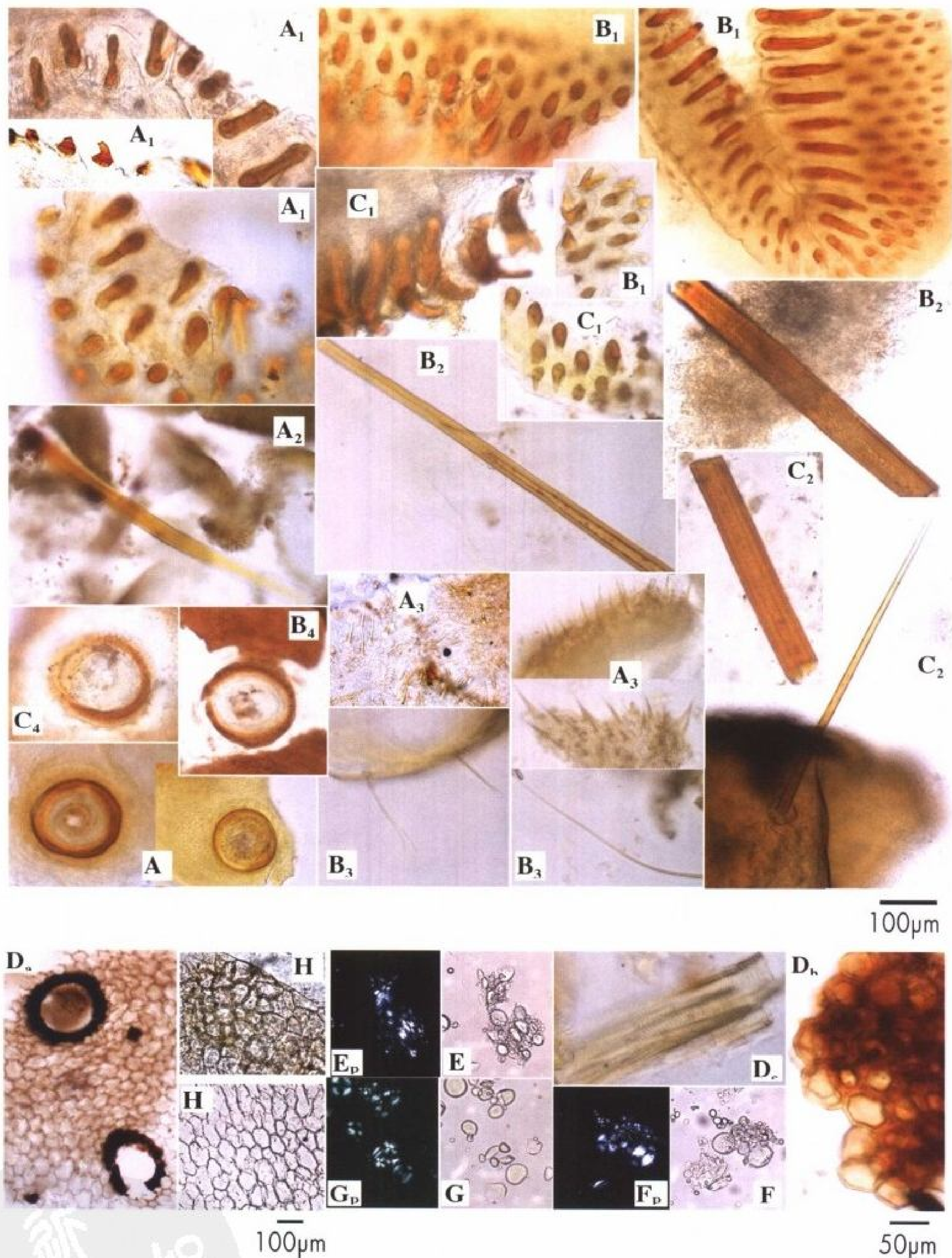


Fig. 3 Microscopic Identification on Setae of Cordyceps sinensis and its Seven Counterfeits

A. Cordyceps sinensis B. Cordyceps hawkesii C. Counterfeit forged by Dendrolimus spp. adhered with Hemerocallis spp. D. Polypodiods nipponica E ~ G. Counterfeit forged by starch H. Stachys sieboldii

1. The stubby seta 2. The macrotrichia 3. The microtrichia 4. The big setal sac
a. Fragments of vascular bundles b. Cork cells c. Vessels d. Parenchymatous cells P. Under polariscope

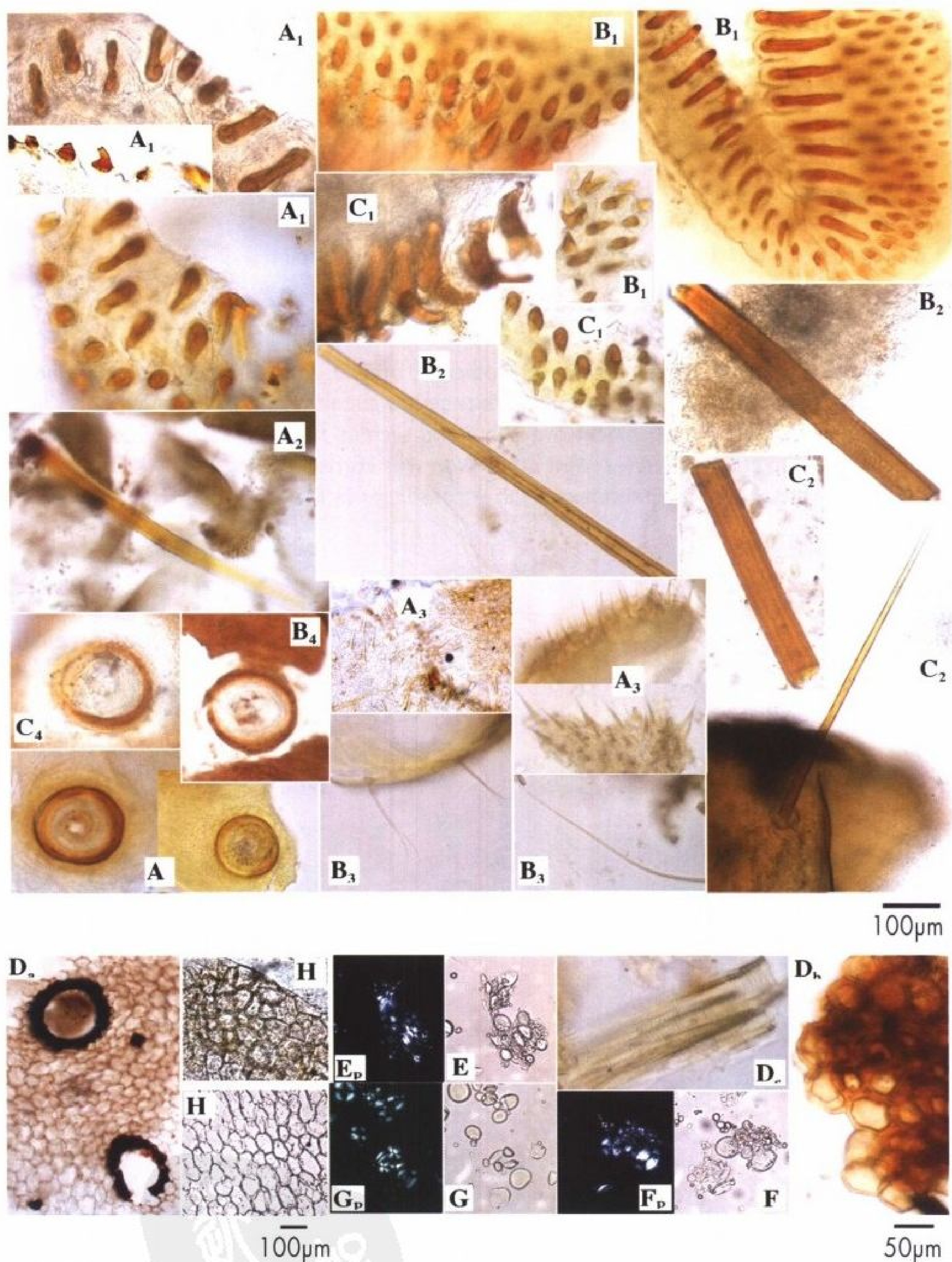


图3 冬虫夏草和其7种伪品的显微鉴别

A.冬虫夏草 Cordyceps sinensis B.亚香棒虫草Cordyceps hawkesii C. 松毛虫粘结黄花菜伪品Counterfeit forged by Dendrolimus spp. adhered with Hemerocallis spp. D. 石蚕Polypodiods nipponica E ~ G. 淀粉为品Counterfeit forged by starch H.草石蚕 Stachys sieboldii

1.短刚毛 2.长毛 3.微刺 4.毛窝 a.维管束碎片 b.木栓细胞 c.导管 d. 薄壁细胞 P:偏光镜下

2. Identification of CPM

When using microscopic identification to identify CPM, some points should be noted:

i) Know the form of medication, and be familiar with the constituents of prescription;

ii) Eliminate the overlapped interference; and identify the specific features;

iii) Master the standard operation and ensure an accurate result

[Example 2] Identification of Wu Zi Yan Zong Wan (五子衍宗丸) [3]

Wu Zi Yan Zong Wan, as a classical Chinese Medicine Formula, is used for replenishing the kidney with vital essence. Both of the CPM and healthcare products circulate not only in mainland China and Hong Kong, but also in many other places over the world such as Japan and the United States as well. The microscopic identification on Wu Zi Yan Zong Wan was carried out together with its 5 composed crude drug samples to ensure the existence of those constitutes in the CPM. See Fig. 4.

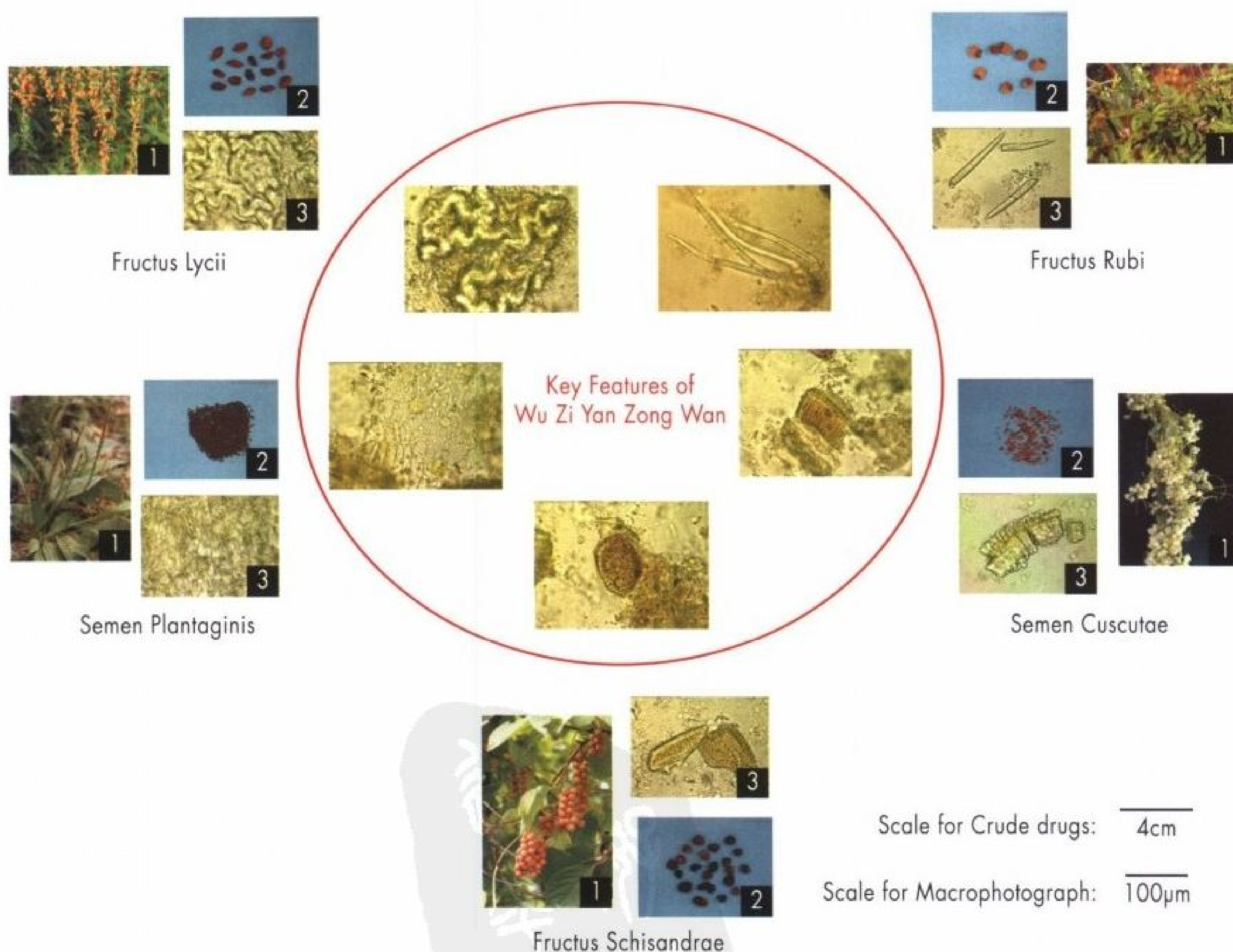


Fig. 4 Identification of Wu Zi Yan Zong Wan
1.original plant 2.crude drugs 3.key features of microscopic identification

2. 中成药的鉴别

使用显微鉴别法鉴别中成药时,要注意以下三大要点:

1) 了解剂型制法,熟悉组方药材;

2) 排除交叉干扰,明确专属特征;

3) 熟练正规操作,确保结果准确。

[实例2] 五子衍宗丸的鉴别[3]

五子衍宗丸是中药的古方,主要有补肾壮阳作用。其中成药和保健品流通于中国、日本、美国。使用显微鉴别的方法可以鉴别五子衍宗丸成药的生药组成,以确保成药中含有5种主药。见图4。

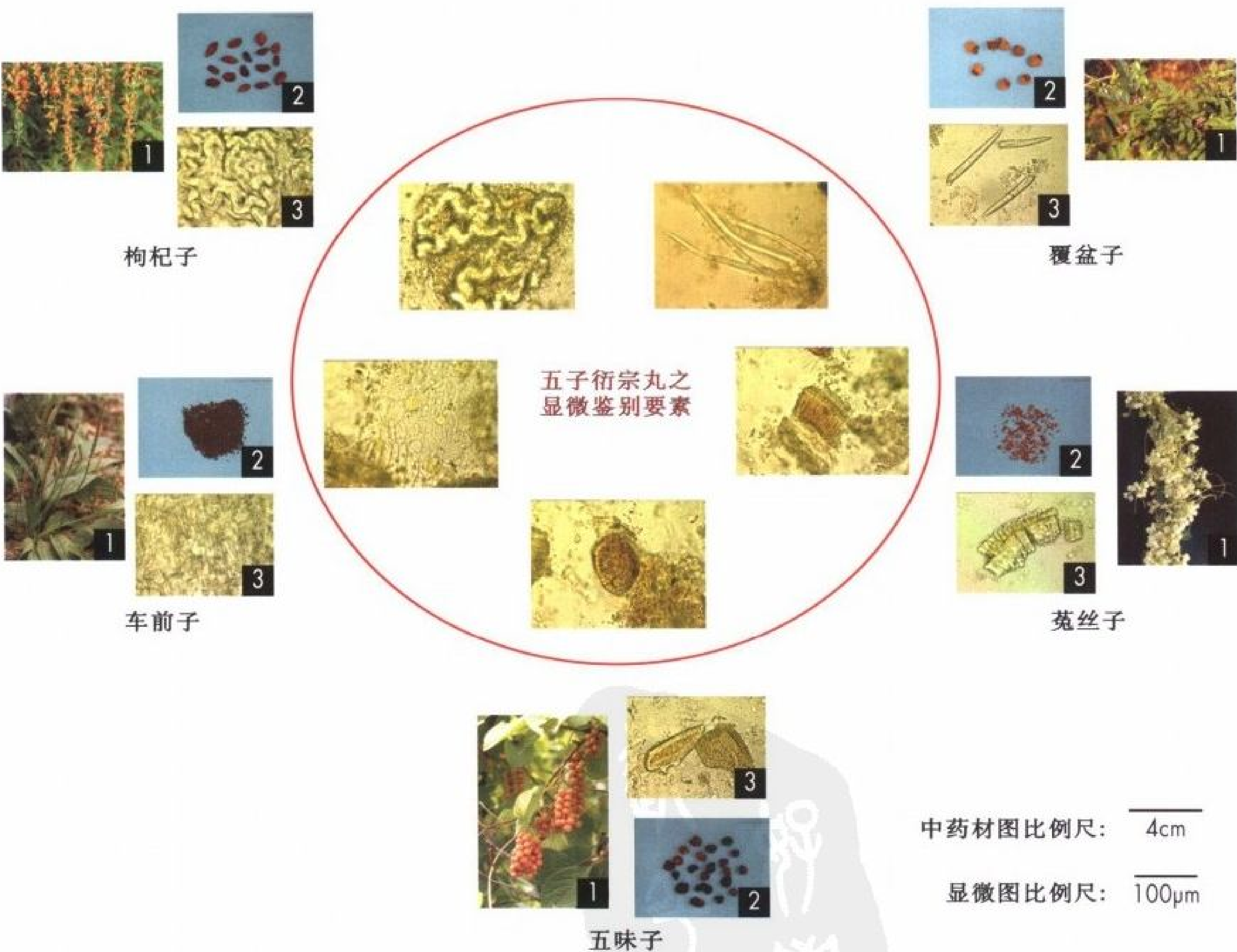


图4 五子衍宗丸的鉴别
1.原植物 2.药材 3.显微鉴别要素

In general, microscopic identification of CPM can be classified into two situations. One is with the known constitutes, as shown in the above example, and the other is with unknown ones. In the later case, the identification is much more difficult, for we have to master plenty of microscopic features of single CMM powder. However, apart from the microscope, a variety of ways can also be used in identification. For example, CMM in the prescriptions, which do not have very specific microscopic features, like Borneol (Borneolum syntheticum), could be identified by the microsublimation method.

3. The application of polarizing microscope in identification [4-7]

[Example 3] Identification of Zhibao Sanbian Wan (至宝三鞭丸) by Polarized microscopy

Zhibao Sanbian Wan, as a traditional Chinese Medicine commonly used for tonicity in China and Japan, is in the form of a large honey pill composing of 38 kinds of powder crude drugs. Fragments of powder crude drugs constituents are usually partly hidden by several other co-existing crude drugs and additives. In such cases, polariscopic identification is suggested to be the first choice. Under a polarizing microscope, the key objects of 34 powder drugs can be identified easily and clearly without staining or chloral hydrate transparent process. See Fig. 5 and Fig. 6.

VII. Summary

Nowadays, with the combination of techniques of microscopic observation and photograph processing by computer software, the identification work becomes more and more convenient [8, 9]. Moreover, followed by the application of histochemistry and quantitative technology, we believe that the microscopic identification on CMM and CPM will be applied more extensively.

Fig. 5 Microscopic identification of the key objects in Zhibao Sanbian Wan under Polarizing microscope
图5 至宝三鞭丸中主要药材的偏光特征

1. 牡丹皮Cortex Moutan 2.牛膝Radix Achyranthis 3. 小茴香Fructus Foeniculi
4.黄芪 Radix Astragali 5. 黄柏Cortex Phellodendri 6. 远志Radix Polygalae
7.花椒 Fructus Zantoxyli 8. 白芍Radix Paeoniae 9. 苍术Rhizoma Atractylodis
10. 泽泻Rhizoma Alismatis 11. 地黄Radix Rehmanniae 12. 当归Radix Angelicae
13. 肉桂Cortex Cinnamomi 14. 人参Radix Ginseng 15. 甘松Radix et Rhizoma Nardostachyos
16. 肉苁蓉Herba Cistanches 17. 巴戟天Radix Morindae Officinalis

中成药的显微鉴别,分为已知组成样品和未知组成样品两类,以上所及仅为已知处方的样品。至于未知组成样品的鉴别,难度相应增大,但只要掌握大量的单味药粉末显微特征,积累丰富的鉴别经验,同样可以逐步解决。鉴别时,为方便观察,还应考虑多种手段的应用。若某些特殊的组成药材,粉末显微特征不易确定,可用微量升华的方法来解决,如冰片等。

3. 偏光显微镜在鉴别中的应用[4-7]

[实例3] 至宝三鞭丸的鉴别

至宝三鞭丸是常用的补益中药,由38种生药研成粉后制成大蜜丸。其药材的碎片会被少数其它药材或赋形剂所包埋,因此,建议首选偏光显微镜来鉴别其成分。偏光显微镜,便于清晰地分辨出34种中药的主要鉴别特征。见图5、图6。

七、结语

现今,将显微镜和计算机图像处理技术相给合,使鉴别工作更加方便[8,9]。随着组织化学、定量技术的逐步深入,相信显微鉴别技术在中药材、中成药中的应用会更加广泛。





Fig. 6 Microscopic identification of the key objects in Zhibao Sanbian Wan under Polarizing microscope
图6 至宝三鞭丸中主要药材的偏光特征

18. 山药Rhizoma Dioscoreae 19. 何首乌Radix Polygoni Multiflori 20.海马 Hippocampus
21. 蛤蚧Gecko 22. 沉香Lignum Aquilariae Resinatum 23. 阳起石Tremolitum 24. 山茱萸Fructus Corni
25. 淫羊藿Herba Epimedii 26. 桑螵蛸Oötheca Mantidis 27. 龙骨Fossilia Ossis Mastodi
28. 覆盆子Fructus Rubi 29. 补骨脂Fructus Psoraleae 30. 藏菖蒲Rhizoma Acori Calami
31. 鹿茸Cornu cervi pantotrichum 32. 杜仲Cortex Eucommiae 33. 菟丝子Semen Cuscutae
34. 枸杞子Fructus Lycii

VIII. Major References 八、主要参考资料与文献

1 The State Pharmacopoeia Commission of The People's Republic of China. Pharmacopoeia of the People's Republic of China. Chemical Industry Press.2005

2 Hu YN, Kang TG, Zhao ZZ. Studies on Microscopic Identification of Animal Drugs' Remnant Hair (1): Identification of Cordyceps sinensis and Its Seven Counterfeits. Natural Medicine. 2003, (5): 163-168

3 Lau PW E, Peng Y, Zhao ZZ.. Microscopic identification of Chinese Patent Medicine (1): Wu Zi Yan Zong Wan. Natural Medicine. 2004, (6): 258-265

4 Pharmacopoeia Commission of the Ministry of Public Health, P.R.C. AColored Atlas of Microscopic Identification of Chinese Materia Medica in Powdered From as Specified in Pharmacopoeia of the People's Republic of China. 1999°D

5 Zhao ZZ, Shimomura H, Sashida Y, Tujino R, Ohamoto T, Kazami T.. Identification of Traditional Chinese Patent Medicine by a Polariscope (1): Polariscopic Characteristics of Starch Grains and Calcium Oxalate Crystals. Natural Medicine. 1996, (6): 389-398

6 Zhao ZZ, Shimomura H, Sashida Y, Ishikawa R, Ohamoto T, Kazami T. Identification of Crude Drugs in Traditional Chinese Patent Medicines by Means of Microscope and Polariscope (2): Polariscopic Characteristics of Stone Cells, Vessels and Fibers Natural Medicine. 1997, (6): 504-511

7 Zhao ZZ, Kazami T, Suzuki R, Shimomura H. Identification of Traditional Chinese Patent Medicines by Polariscope (3): Polariscopic Characteristics of ZhiBao Sanbian Wan Natural Medicine. 1998, (6): 485-490

8 Hu YN, Kang TG, Zhao ZZ. Studies on Microscopic Identification of Animal Drugs' Remnant Hair (2): Identification of Ground Beetle and Its Counterfeits. Nat Med 2004,(5): 185-192

9 Cheng XX, Kang TG, Zhao ZZ. Studies on Microscopic Identification of Animal Drugs' Remnant Hair (3): Identification of Several Species of Cauda Cervi. Natural Medicine. 2005. In Press



Contents
目录

An Illustrated Microscopic Identification of Chinese Materia Medica

中药显微鉴别图鉴

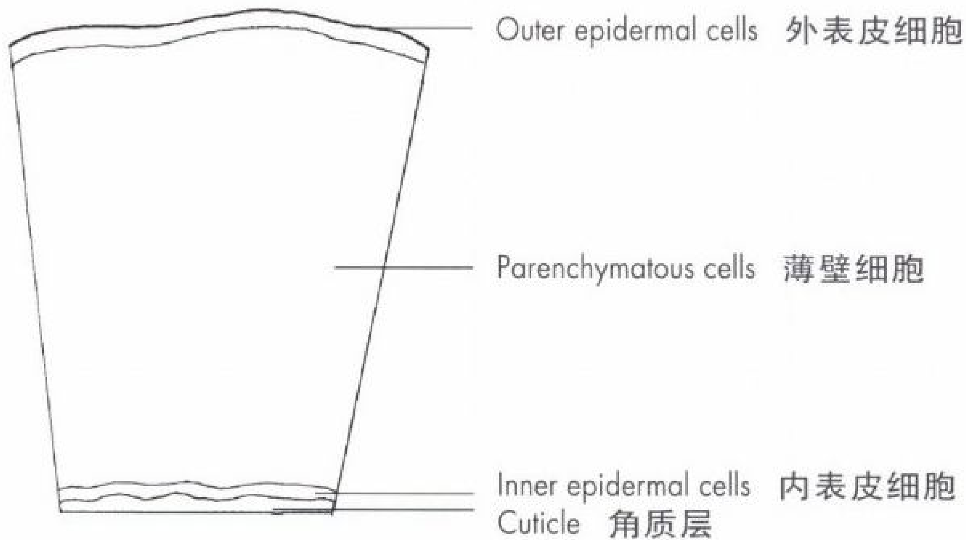


龙眼肉 Longyanrou

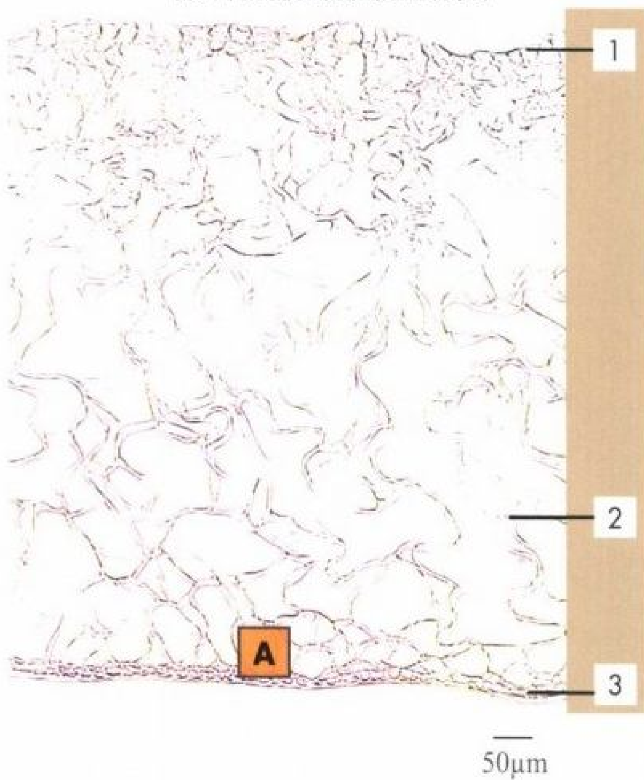


The dried aril of *Dimocarpus longan* Lour. (Fam. Sapindaceae)
无患子科植物龙眼的干燥假种皮。

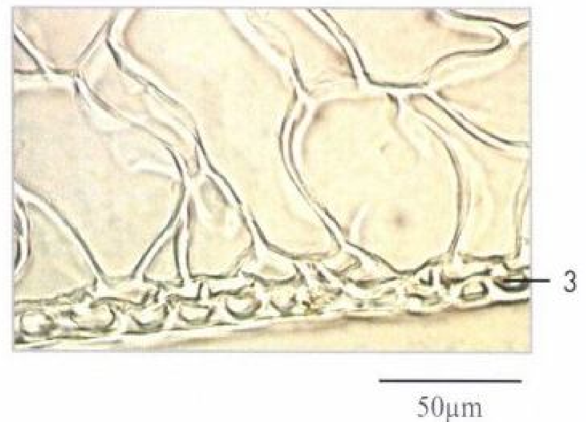
Sketch of transverse section of aril 假种皮横切面简图



Transverse section of aril
假种皮横切面组织图



A ***Inner epidermal cells***
内表皮细胞

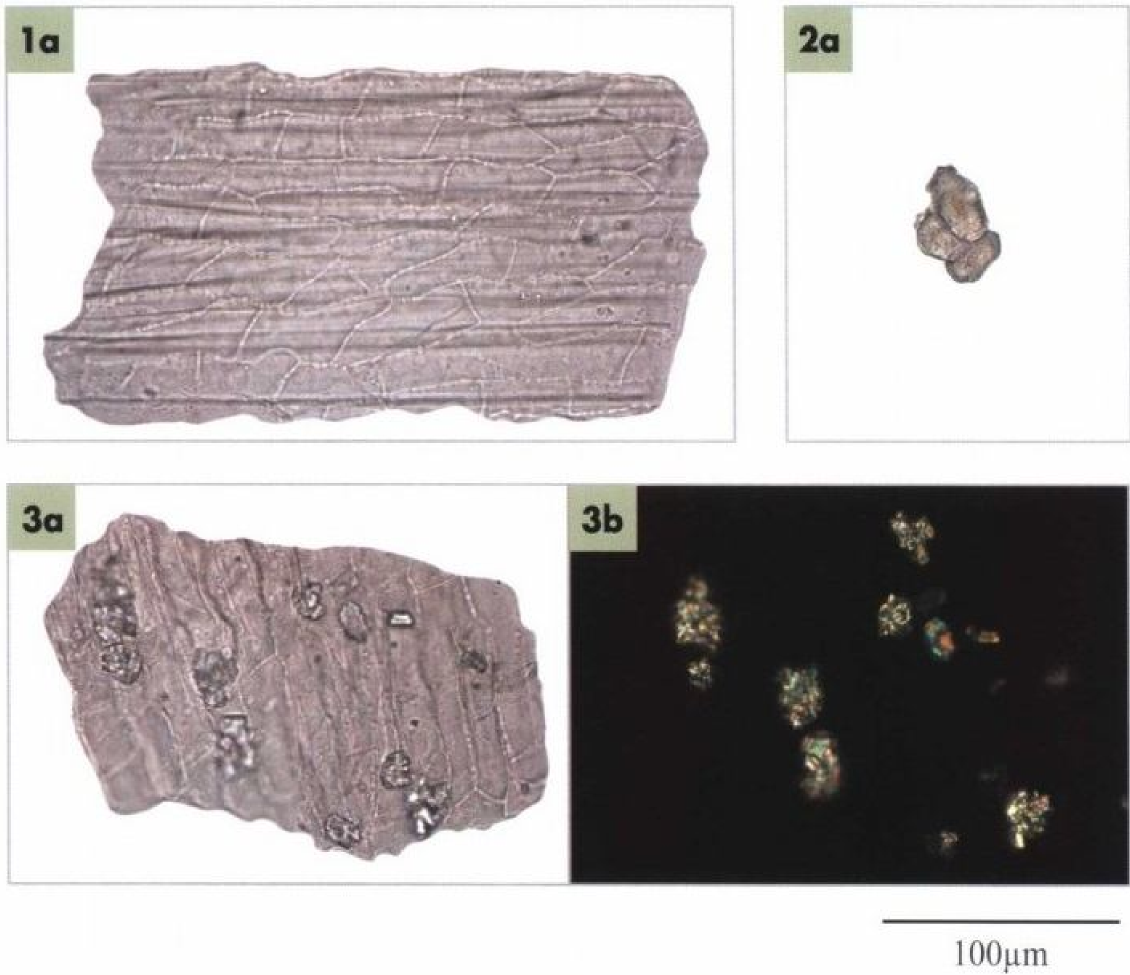


Transverse section of aril

1. Outer epidermal cells	1 row, subsquare.
2. Parenchymatous cells	Large, strip-shaped; between inner and outer epidermis, about 148μm in diameter. Some cells containing pale yellow clumps and fatty oil droplets.
3. Inner epidermal cells	1 row, with relatively thickened wall; covered with a thickened cuticle.

假种皮横切面组织图注

1. 外表皮细胞	1列，呈类方形。
2. 薄壁细胞	大型，条状，位于内外表皮间，直径约148μm。有的细胞中含淡黄色团块及脂肪油滴。
3. 内表皮细胞	1列，壁稍厚，外被较厚的角质层。



Notes

1. Outer epidermal cells	Slightly subsquare or polygonal; strip-shaped parenchymatous cells on the internal surface, cell walls undulantly curved.
2. Stone cells	Mostly strip-shaped, ovate, subrectangular in shape; 47μm long, about 31μm in diameter; pits and pit canals distinct.
3. Crystals of calcium oxalate	Numerous crystals of calcium oxalate in the parenchymatous cells; rhombus, polyhedron, square or irregular in shape, about 21μm long.

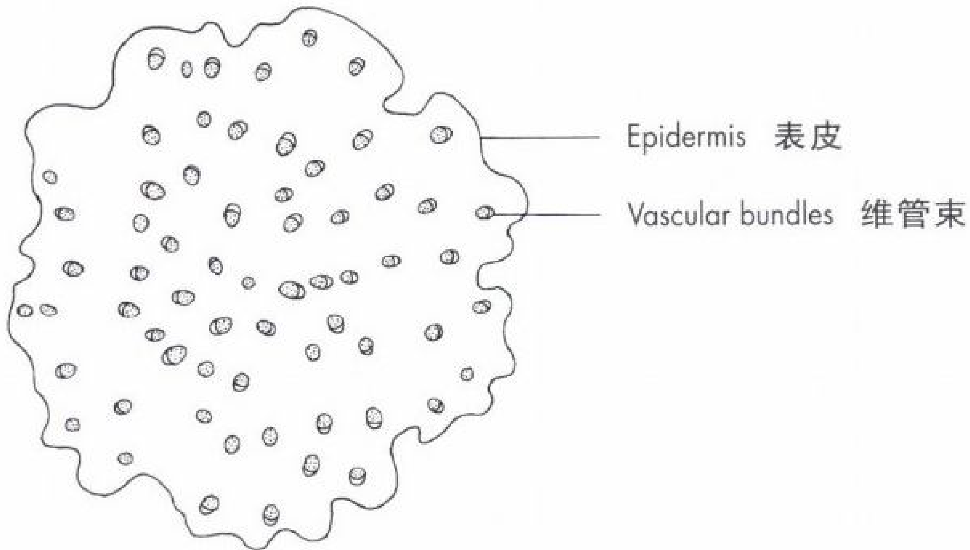
图注

1. 外表皮细胞	略呈方形或多角形，内面多为条状薄壁细胞，细胞壁显波状弯曲。
2. 石细胞	常见有条形、卵形、类方形，长约47μm，直径约31μm，纹孔和孔沟多明显。
3. 草酸钙结晶	薄壁细胞内含有大量草酸钙结晶，呈菱形、多面体形、方形或不规则形，长约21μm。

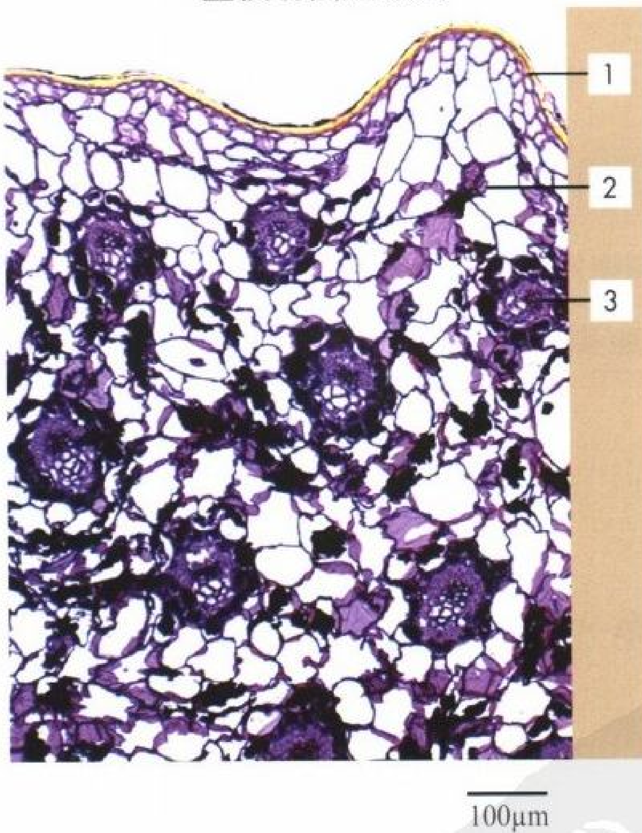


The fresh or dried stem of *Dendrobium candidum* Wall. ex Lindl. (Fam. Orchidaceae).
兰科植物铁皮石斛的新鲜或干燥的茎。

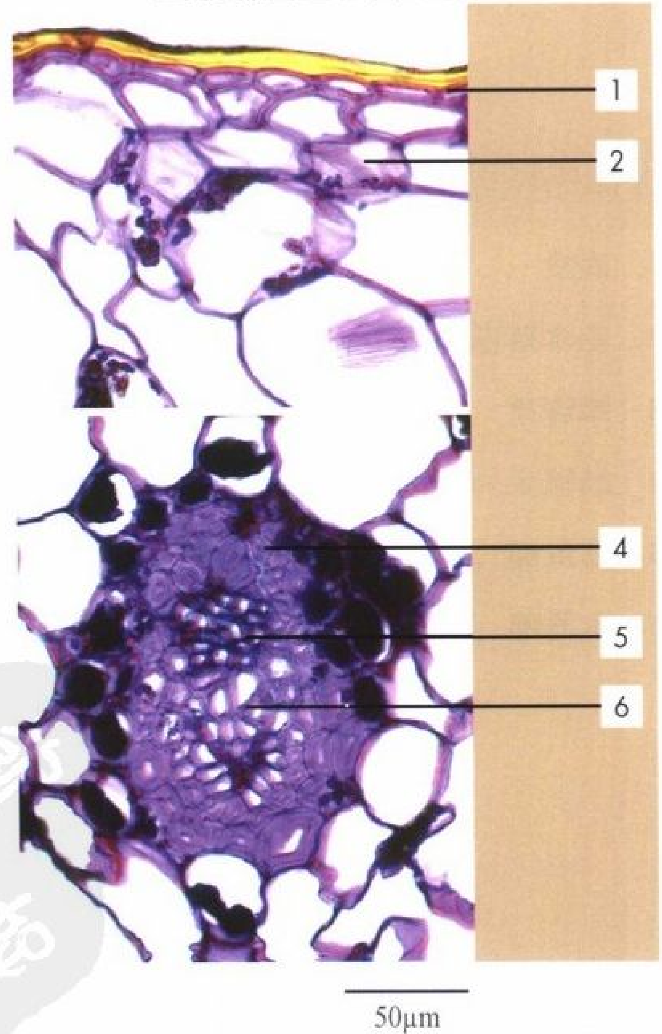
Sketch of transverse section of stem
茎横切面简图



Transverse section of stem
茎横切面组织图



Transverse section of stem (Partial)
茎横切面组织图(部分)



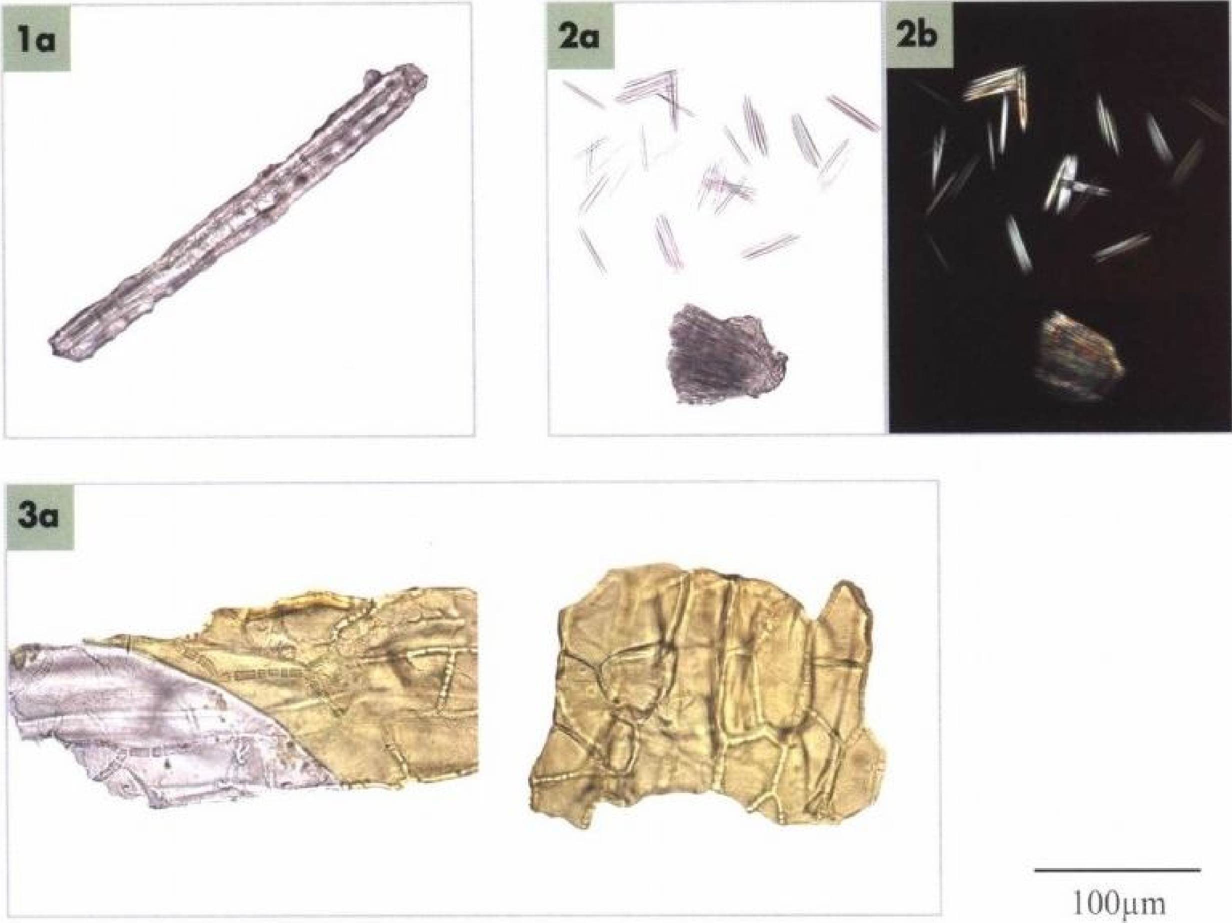
Transverse section of stem

1. Epidermis	1 row of cells, thin and flat, with slightly lignified lateral walls and orange cuticles.
2. Elementary parenchyma	The cells containing raphides of calcium oxalate occurring near the epidermis.
3. Vascular bundles	Closed collateral vascular bundles.
4. Fibre groups outside of vascular bundles	Hat-shaped, consisting of 1~5 rows of fibres.
5. Phloem	Consisting of several cells.
6. Xylem	Vessels in xylem with similar size.

茎横切面组织图注

1. 表皮	1列细胞，扁平，侧壁微木化，角质层橙黄色。
2. 基本薄壁组织	含草酸钙针晶束细胞多见于近表皮处。
3. 维管束	有限外韧型。
4. 维管束外侧纤维群	帽状，1~5列纤维。
5. 韧皮部	数个细胞组成。
6. 木质部	木质部导管大小近似。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibres	Long fusiform; 17~26μm in diameter, some margins with dentated protuberances; pits and pit canals rare.
2. Raphides of calcium oxalates	Mainly present in parenchymatous cells in bundles; raphides 112μm long.
3. Epidermal cells	Strip-shaped, long polygonal or subpolygonal on the surface view, 17~38μm in diameter, the anticlinal walls bead-like, pits rare or unclear.

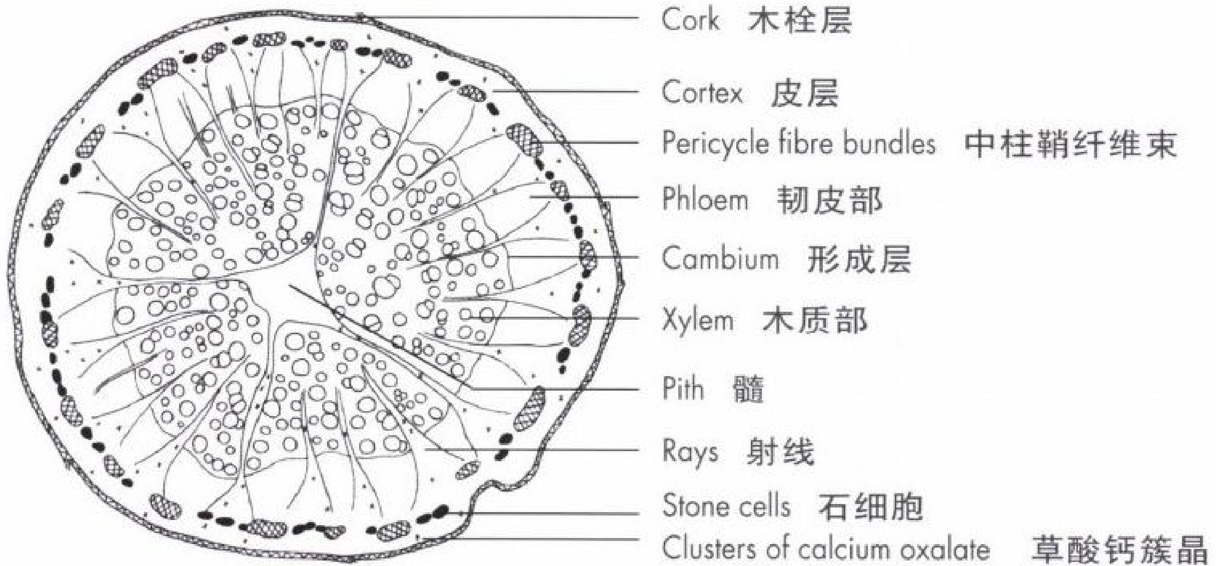
图注

1. 纤维	呈长梭形，直径17~26μm，有的边缘呈齿状突起，纹孔甚少，孔沟稀疏。
2. 草酸钙针晶	多成束存在于薄壁细胞中。束长约至112μm。
3. 表皮细胞	表面观长条形、长多角形或类多角形，直径17~38μm，垂周壁连珠状，纹孔稀少或不明显。

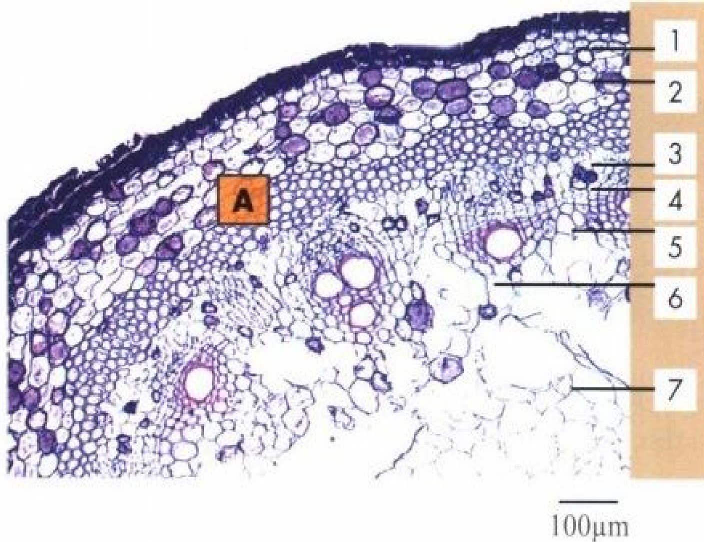


The dried vine of *Polygonum multiflorum* Thunb. (Fam. Polygonaceae).
蓼科植物何首乌的干燥藤茎。

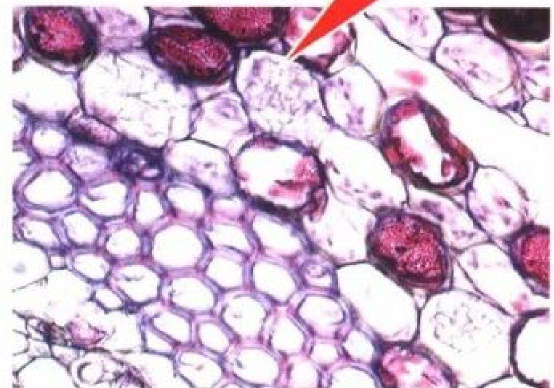
Sketch of transverse section of vine
藤茎横切面组织简图



Transverse section of vine
藤茎横切面组织图



A ***Parenchymatous cells containing clusters of calcium oxalate***
薄壁细胞中含有草酸钙簇晶





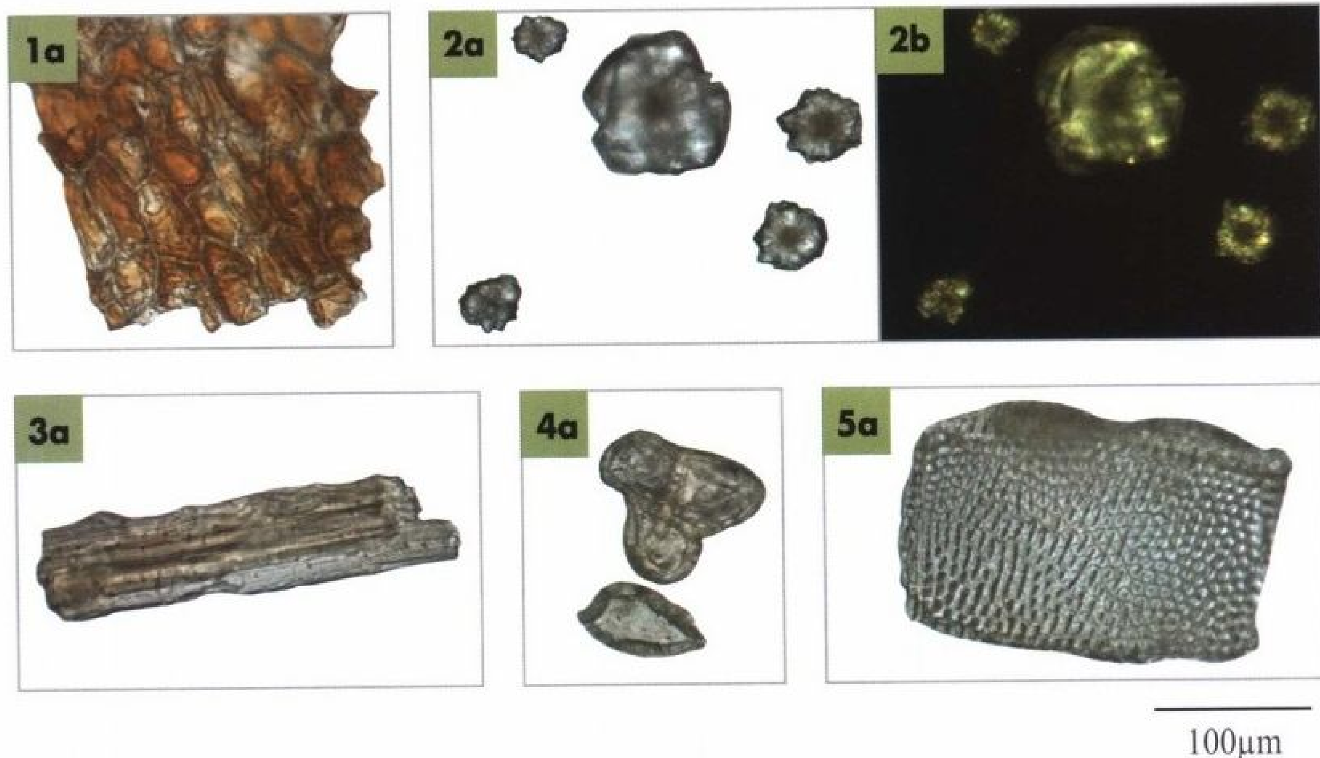
Transverse section of vine

1. Cork	3~4 rows of cork cells, containing brown pigments.
2. Cortex	Narrow.
3. Pericycle fibre bundles	Arranged in an interrupted ring, walls of fibres very thick and lignified. Stone cell groups present among the fibre bundles.
4. Phloem	Relatively broad.
5. Cabium	In a ring.
6. Xylem	Vessles subrounded, up to 204μm in diameter, scattered singly or several in groups.
7. Pith	Relatively small.
Parenchymatous cells	Containing clusters of calcium oxalate.

藤茎横切面组织图注

1. 木栓层	3~4列木栓细胞，含棕色色素。
2. 皮层	窄。
3. 中柱鞘纤维束	断续排列成环，纤维壁甚厚，木化。在纤维束间时有石细胞群。
4. 韧皮部	较宽。
5. 形成层	成环。
6. 木质部	导管类圆形，直径约至204μm，单个散列或数个相聚。
7. 髓	较小。
薄壁细胞	含草酸钙簇晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Cork cells	Reddish-brown. On the surface view: subsquare or irregular in shape, walls relatively thickened and slightly undulant.
2. Clusters of calcium oxalate	Numerous, singly scattered or arranged in a line present in parenchyma, angles blunt. Polychromatic under a polarizing microscope.
3. Fibres	Mostly in bundles, pale yellow. Relatively long, thickened walls, lumina narrow and pit canals distinct.
4. Stone cells	Usually in groups, pale yellow. Rectangular, subsquare, subtriangular or irregular in shape; walls thin; lumina large; pits and pit canals distinct.
5. Vessels	Mostly bordered pit vessels, pits arranged densely and pit apertures distinct.

图注

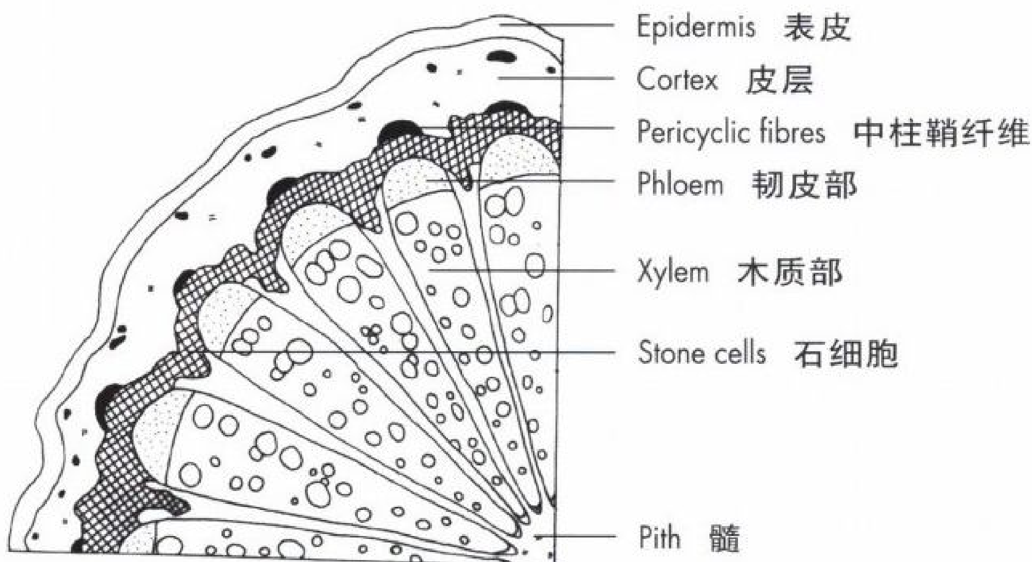
1. 木栓细胞	红棕色。表面观类方形或不规则形，壁较厚，微波状弯曲。
2. 簇晶	较多，单个散在或位于薄壁细胞中排列成行，棱角较钝。偏光下呈多彩状。
3. 纤维	多成束，淡黄色。较长，壁厚，胞腔较窄，孔沟明显。
4. 石细胞	多成群，淡黄色。呈长方形、类方形、类三角形或不规则形，壁较薄，胞腔大，纹孔和孔沟明显。
5. 导管	多为具缘纹孔导管，纹孔排列紧密，纹孔口明显。

青风藤 Qingfengteng

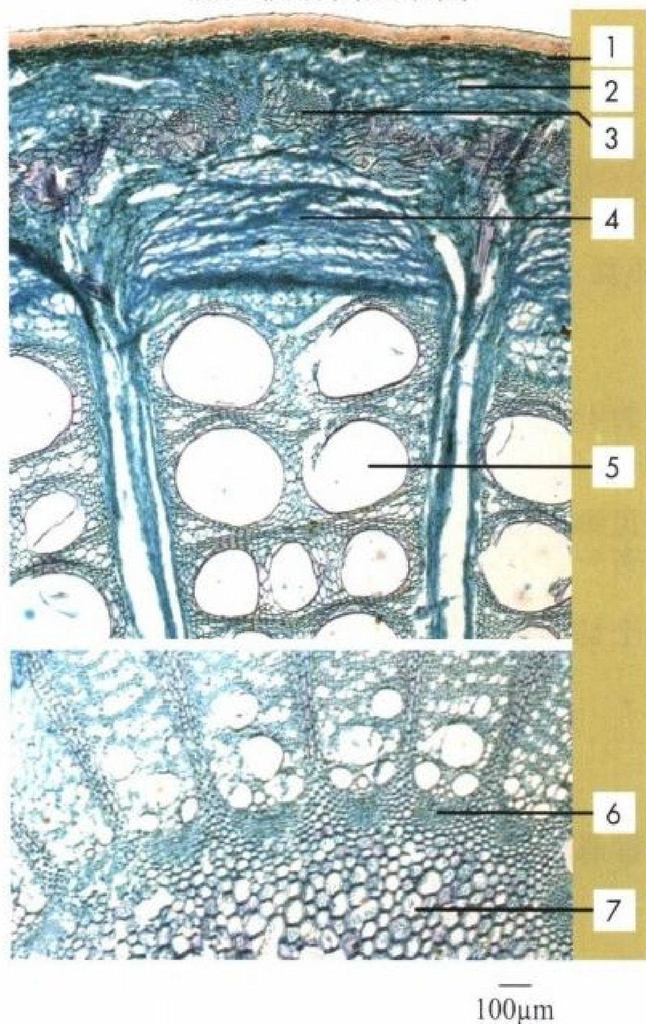


The dried vine of *Sinomenium acutum* (Thunb.) Rehd. et Wils. (Fam. Menispermaceae).
防己科植物青藤的干燥藤茎。

Sketch of transverse section of vine
藤茎横切面简图

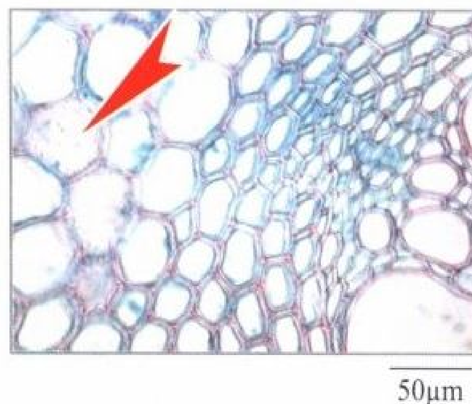


Transverse section of vine
藤茎横切面组织图



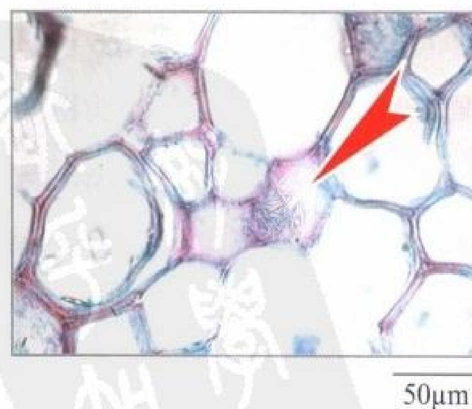
100μm

A *Cells surrounding pith*
环髓细胞



50μm

B *Raphides of calcium oxalate in parenchymatous cell.*
薄壁细胞中的草酸钙针晶



50μm

Transverse section of vine

1. Epidermis	1 row of cells, covered with a thick cuticle, some with cork cells.
2. Cortex	Scattered with fibres and stone cells.
3. Pericyclic fibres	Lunate, usually consisting of 2~5 rows of stone cells at the inner side, and tangentially elongated, linked with stone cell groups of rays to a ring.
4. Phloem	Phloem rays gradually wide outwards, conical or branched stone cells visible; phloem cells mostly obliterated, some of them scattered with 1~3 fibres outside, and several rows of parenchymatous cells inside.
5. Xylem	Vessels singly scattered or several linked up tangentially.
6. Cells surrounding pith	Slightly thickened walls, and with distinct pits.
7. Pith	Pale yellow.
Parenchymatous cells	Containing starch granules and raphides of calcium oxalate.

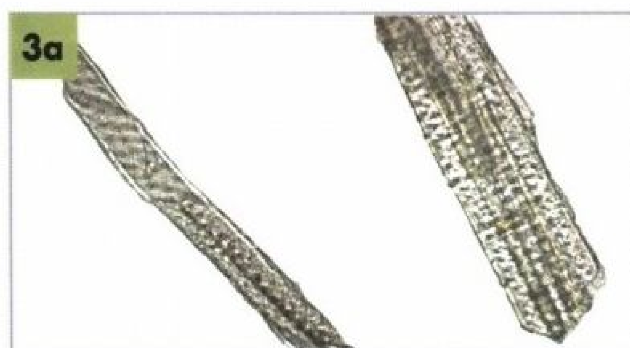
藤茎横切面组织图注

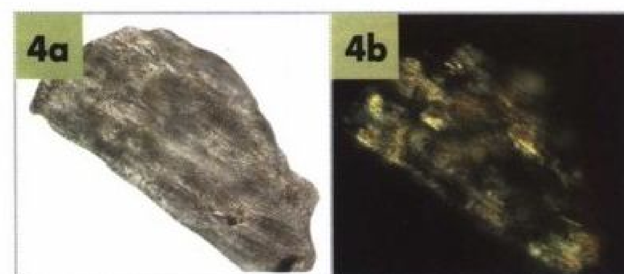
1. 表皮	1列细胞，被厚角质层，有的具木栓细胞。
2. 皮层	散有纤维及石细胞。
3. 中柱鞘纤维	新月形，其内侧常为2~5列石细胞，并切向延伸与射线中的石细胞群连接成环。
4. 韧皮部	射线向外渐宽，可见锥形或分枝状石细胞；韧皮部细胞大多颓废，有的外侧散有1~3个纤维，内侧有数列薄壁细胞。
5. 木质部	导管单个散在或数个切向连接。
6. 环髓细胞	壁稍厚，纹孔明显。
7. 髓	淡黄色。
薄壁细胞	含淀粉粒及草酸钙针晶。

Main Powder Characteristics
主要粉末显微特征











100μm

Notes

1. Stone cells	Pale yellow or yellow; subsquare, fusiform, elliptical or irregularly shaped; with relatively thickened walls; pit canals distinct.
2. Pericyclic fibres	Pale yellow or colorless; in bundles or scattered, about up to 50μm in diameter, with slightly thickened walls; lumina distinct.
3. Xylem fibres	Slender, 9~34μm in diameter. Fibre tracheids with bordered pitted apertures oblique, cruciate or V-shaped; libriform fibres with oblique pits and pit canals varying in density.
4. Raphides of calcium oxalate	Abundant, fine and small, consisting in parenchymatous cells. Brightly yellowish-white color observed under a polarizing microscope.

图注

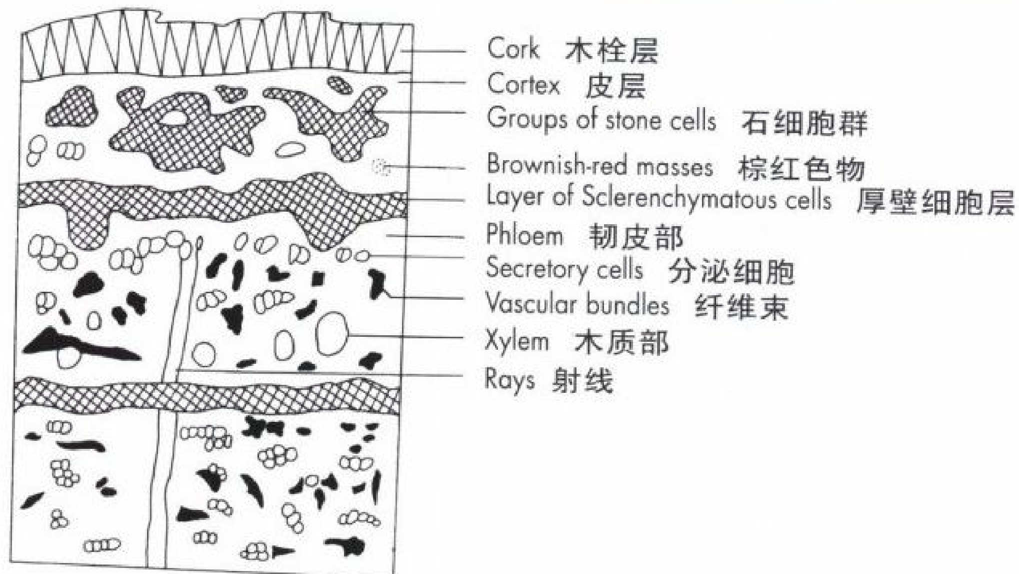
1. 石细胞	淡黄色或黄色，类方形、梭形、椭圆形或不规则形，壁较厚，孔沟明显。
2. 中柱鞘纤维	微黄色或无色，成束或散在，直径约至50μm，壁稍厚，胞腔明显。
3. 木纤维	细长，直径9~34μm。纤维管胞具缘纹孔的纹孔口斜缝状或十字状、人字状；韧形纤维具斜纹孔，孔沟疏密不一。
4. 草酸钙针晶	较多，细小，存在于薄壁细胞中。偏光显微镜下结晶呈亮黄白色。



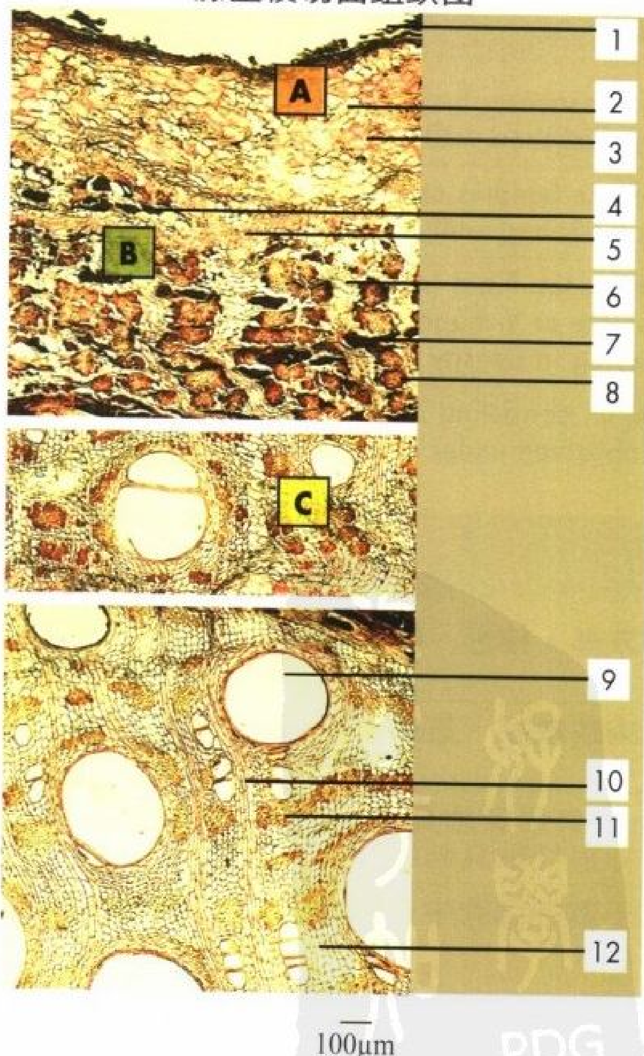
鸡血藤 Jixueteng

The dried vine of *Spatholobus suberectus* Dunn. (Fam. Fabaceae).
豆科植物密花豆的干燥藤茎。

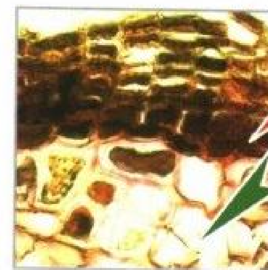
Sketch of transverse section of vine
藤茎横切面简图



Transverse section of vine
藤茎横切面组织图



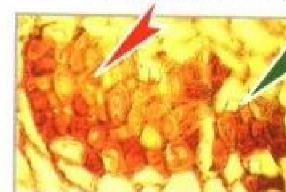
A Cork and cortex 木栓层和皮层



B A layer of sclerenchymatous cells consisting of groups of stone cells and fibre bundles
由石细胞群和纤维束组成的厚壁细胞层



C Fibres and crystal fibres 纤维和晶纤维

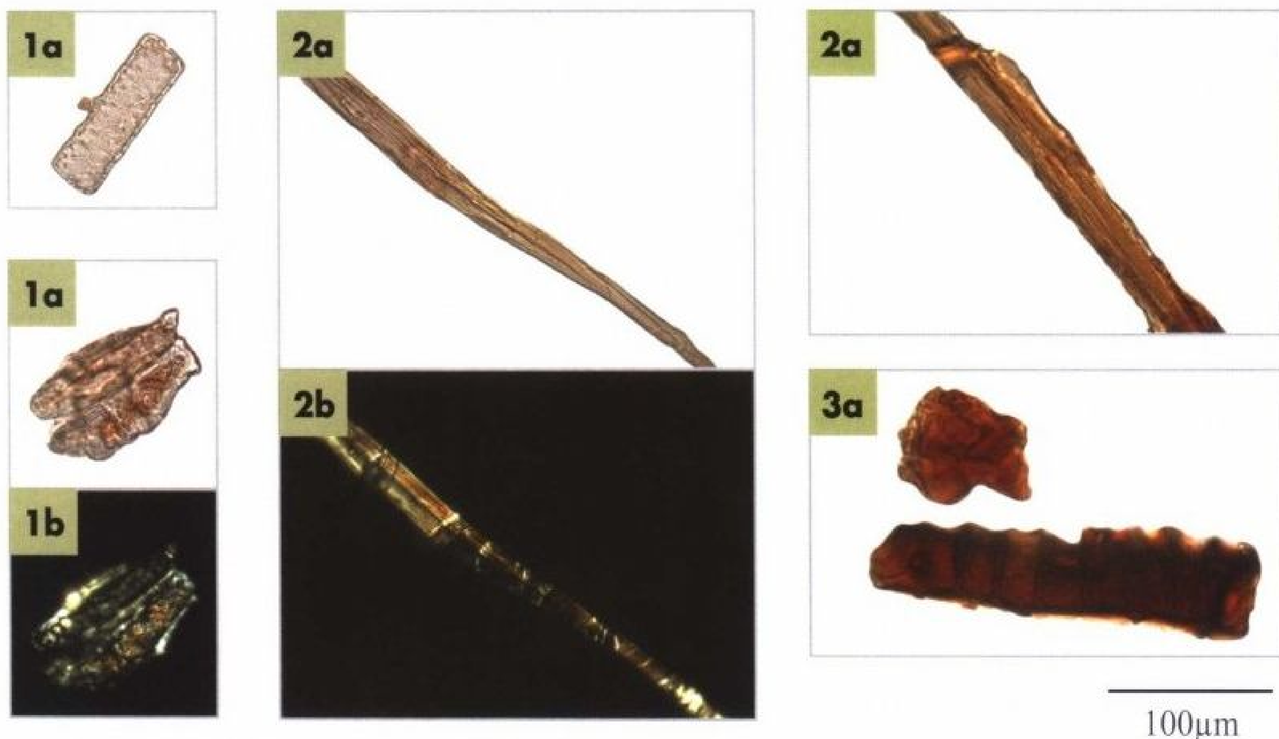


Transverse section of vine

1. Cork	Several rows of cells, containing reddish-brown contents.
2. Cortex	Relatively narrow, parenchymatous cells containing prisms of calcium oxalate.
3. Groups of stone cells	Scattered in cortex and phloem, filled with brownish-red contents in lumina.
4. Brownish-red masses	Scattered, and filling in other cells.
5. Layer of sclerenchymatous cells	A layer of sclerenchymatous cells consisting of groups of stone cells and fibre bundles.
6. Phloem	Usually several cells arranged tangentially, forming a band.
7. Secretory cells	Abundant, filled with brownish-red contents, usually several to more than 10 cells arranged tangentially into layers.
8. Fibre bundles	Numerous, from non-lignified to lignified; with surrounding cells containing prisms of calcium oxalate to form crystal fibres; the walls of crystal cells lignifiedly thickened.
9. Xylem	Most vessels singly scattered, subrounded, about up to 400μm in diameter.
10. Xylem rays	Some with brownish-red contents.
11. Xylem fibre bundles	All forming crystal fibres.
12. Xylem parenchymatous cell	Few with brownish-red contents.

藤茎横切面组织图注

1. 木栓层	细胞数列，含红棕色物。
2. 皮层	较窄，薄壁细胞含草酸钙方晶。
3. 石细胞群	散在皮层及韧皮部中，胞腔内充满棕红色物。
4. 棕红色物	散在，填充于其他细胞中。
5. 厚壁细胞层	石细胞群与纤维束组成的厚壁细胞层。
6. 韧皮部	常数个细胞切向排列成带状。
7. 分泌细胞	甚多，充满棕红色物，常数个至10多个切向排列成层。
8. 纤维束	较多，非木化至木化，周围细胞含草酸钙方晶，形成晶纤维，含晶细胞壁木化增厚。
9. 木质部	导管多单个散在，类圆形，直径约至400μm。
10. 木部射线	有的含棕红色物。
11. 木纤维束	亦均形成晶纤维。
12. 木薄壁细胞	少数含棕红色物。



Notes

1. Stone cells	Often in groups, pale yellow or yellowish-brown in color; rectangular, subround, subtriangular or subsquare in shape; thick-walled cells with clear striations, the cellular lumina containing reddish-brown contents or prims of calcium oxalates.
2. Fibres and crystal fibres	Mainly in bundles; reddish-brown, yellowish-brown, brown or nearly colorless. Fibers slender, non-lignified or lignified; the primary walls easily broken and separate; surface with clefts or longitudinally slit, some endings broken into several parts; pits canals and cellular lumina unclear; the surrounding cells of the fibres containing prisms of calcium oxalates which further form crystal fibres; crystal cells with thick and lignified walls.
3. Brown clumps	Dispersed, clumps or irregular clumps, reddish-brown, yellowish-brown, brown or yellow in color.

图注

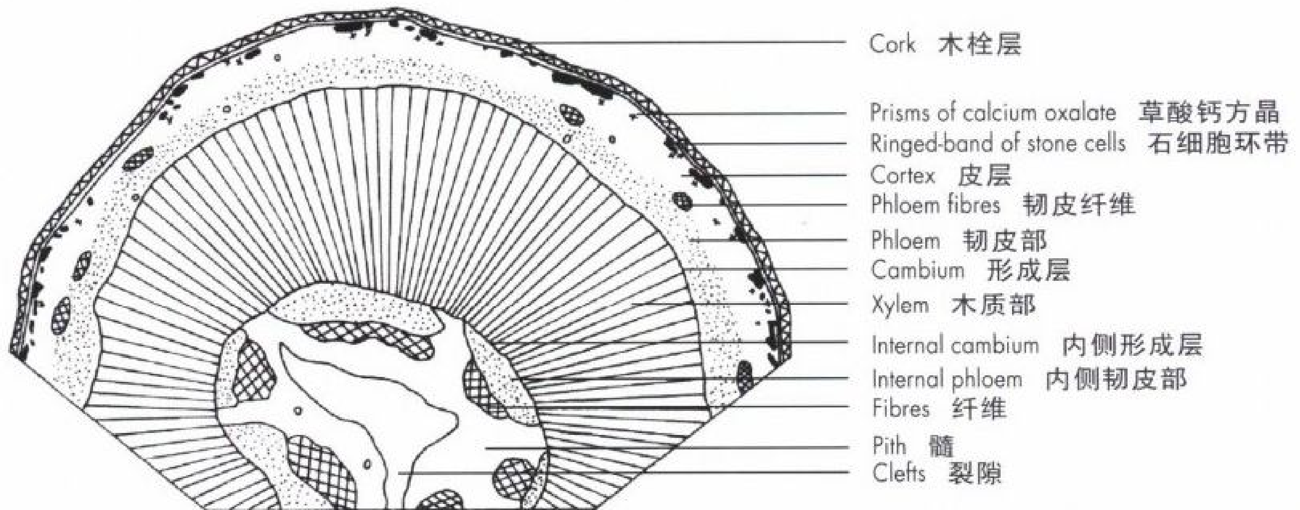
1. 石细胞	多成群，淡黄色或黄棕色。呈长方形、类圆形、类三角形或类方形，壁厚者层纹明显，有的胞腔内含红棕色物，有的含草酸钙方晶。
2. 纤维及晶纤维	多成束，红棕色、黄棕色、棕色或近无色。纤维甚细长，非木化或木化，初生壁易碎离，表面有裂隙，有的纵向开裂，有的末端裂成数条，孔沟及胞腔多不明显。纤维束周围的细胞中含草酸钙方晶，形成晶纤维；含晶细胞的壁甚厚，木化。
3. 棕色块	散在。条块状或不规则块状，红棕色、黄棕色、棕色或黄色。

络石藤 Luoshiteng

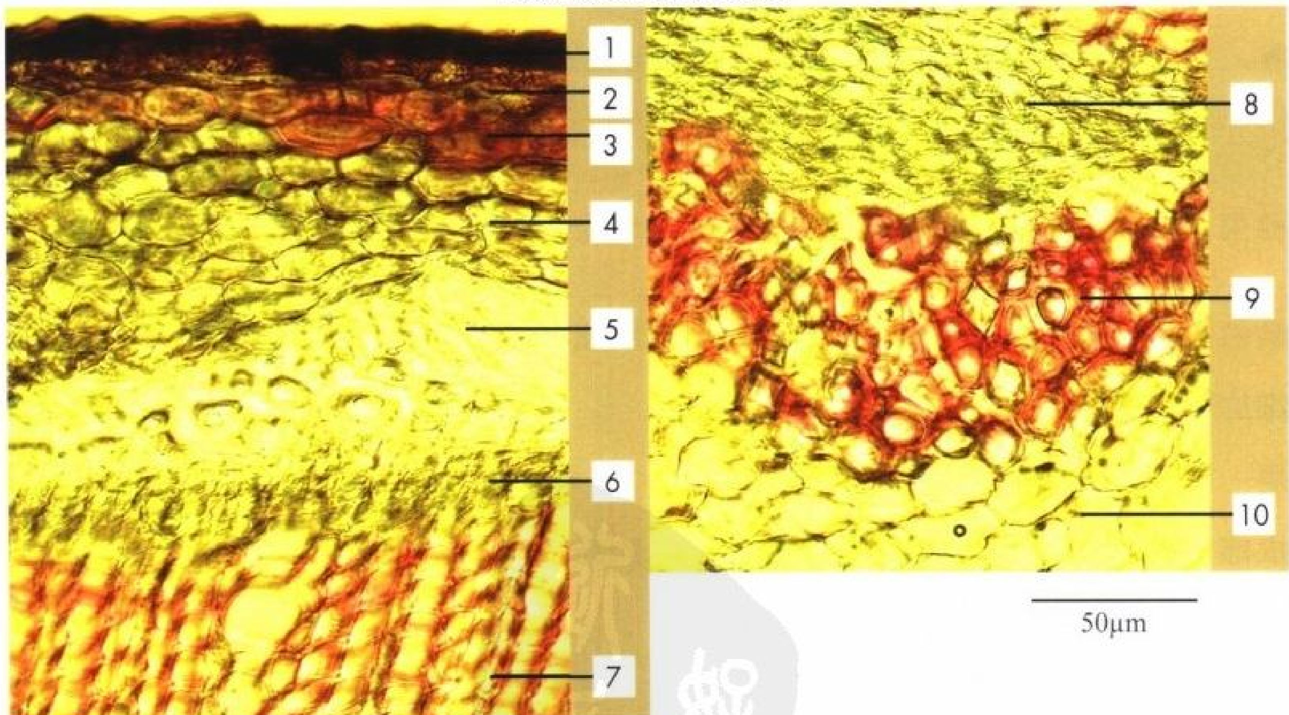


The dried vine of *Trachelospermum jasminoides* (Lindl.) Lem. (Fam. Apocynaceae).
夹竹桃科植物络石的干燥藤茎。

Sketch of transverse section of vine
藤茎横切面简图



Transverse section of vine
藤茎横切面组织图



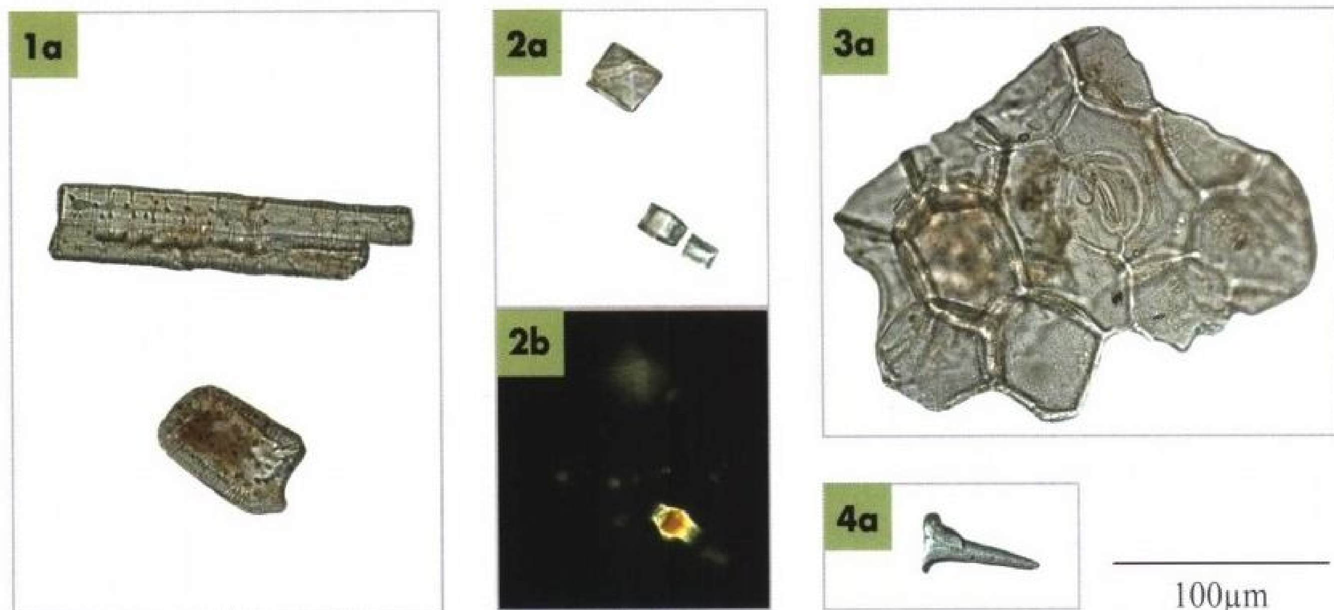
Transverse section of vine

1. Cork	Consisting of several rows of brownish-red cells; showing unicellular non-glandular hairs on the surface, with thick and warty walls.
2. Prisms of calcium oxalate	Present between cork and stone cell ringed-bands.
3. The ringed-band of stone cells	Occurring in the inner side of cork.
4. Cortex	Narrow.
5. Phloem	Thin, showing non-lignified fibre bundles in outer side, arranged in an interrupted ring.
6. Cambium	In a ring.
7. Xylem	Consisting of lignified cells, most vessels singly scattered.
8. Internal cambium and phloem	Present in the inner part of xylem.
9. Lignified fibres	In bundles, surrounding parenchymatous cells containing prisms of calcium oxalate; scattered in pith and usually broken.
10. Pith	Relatively small, and mostly broken; fibres and prisms visible.

藤茎横切面组织图注

1. 木栓层	为棕红色数列木栓细胞；表面可见单细胞非腺毛，壁厚，具壁疣。
2. 草酸钙方晶	存在于木栓层与石细胞环带之间。
3. 石细胞环带	位于木栓层内侧。
4. 皮层	狭窄。
5. 韧皮部	薄，外侧有非木化的纤维束，断续排列成环。
6. 形成层	成环。
7. 木质部	均由木化细胞组成，导管多单个散在。
8. 内侧形成层及韧皮部	位于木质部内方。
9. 木化纤维	成束，周围薄壁细胞含草酸钙方晶；散在于髓部，常破裂。
10. 髓部	较小，多已破裂，可见纤维束及草酸钙方晶。

Main Powder Characteristics
主要粉末显微特征



Notes	
1. Stone cells	Square or rectangular; walls thick, with clear pits and pit canals.
2. Crystals of calcium oxalate	Prisms and clusters visible, polychromatic under a polarizing microscope.
3. Epidermal cells	Upper epidermal cells with straight anticlinal walls; lower epidermal cells with curved anticlinal walls, with prisms and clusters, stomata visible.
4. Non-glandular hairs	Slightly short and small, with thick walls and clear verruca.

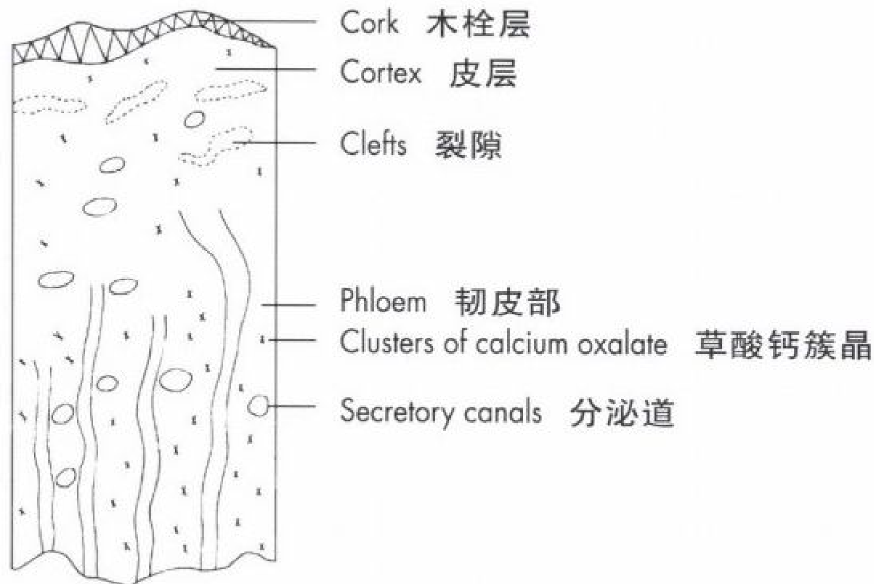
图注	
1. 石细胞	方形或长方形，壁厚，纹孔和孔沟明显。
2. 草酸钙结晶	方晶和簇晶可见，偏光下呈多彩状。
3. 表皮细胞	上表皮细胞垂周壁平直，下表皮细胞垂周壁弯曲，具方晶和簇晶，气孔可见。
4. 非腺毛	较短小，壁厚，有明显的疣状突起。



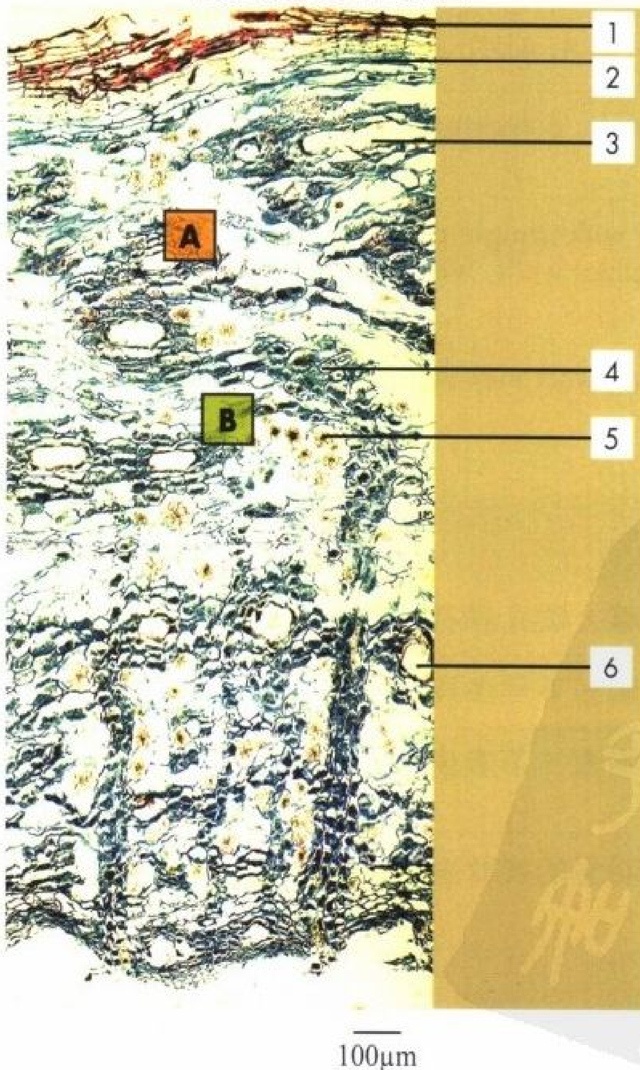
五加皮 Wujiapi

The dried root bark of *Acanthopanax gracilistylus* W. W. Smith. (Fam. Araliaceae).
五加科植物细柱五加的干燥根皮。

Sketch of transverse section of root bark
根皮横切面简图



Transverse section of root bark
根皮横切面组织图



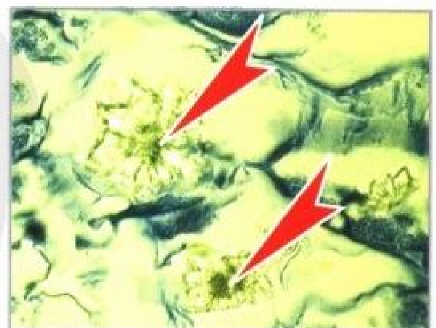
100μm

A Secretory canal
分泌道



50μm

B Clusters of calcium oxalate
草酸钙簇晶



50μm

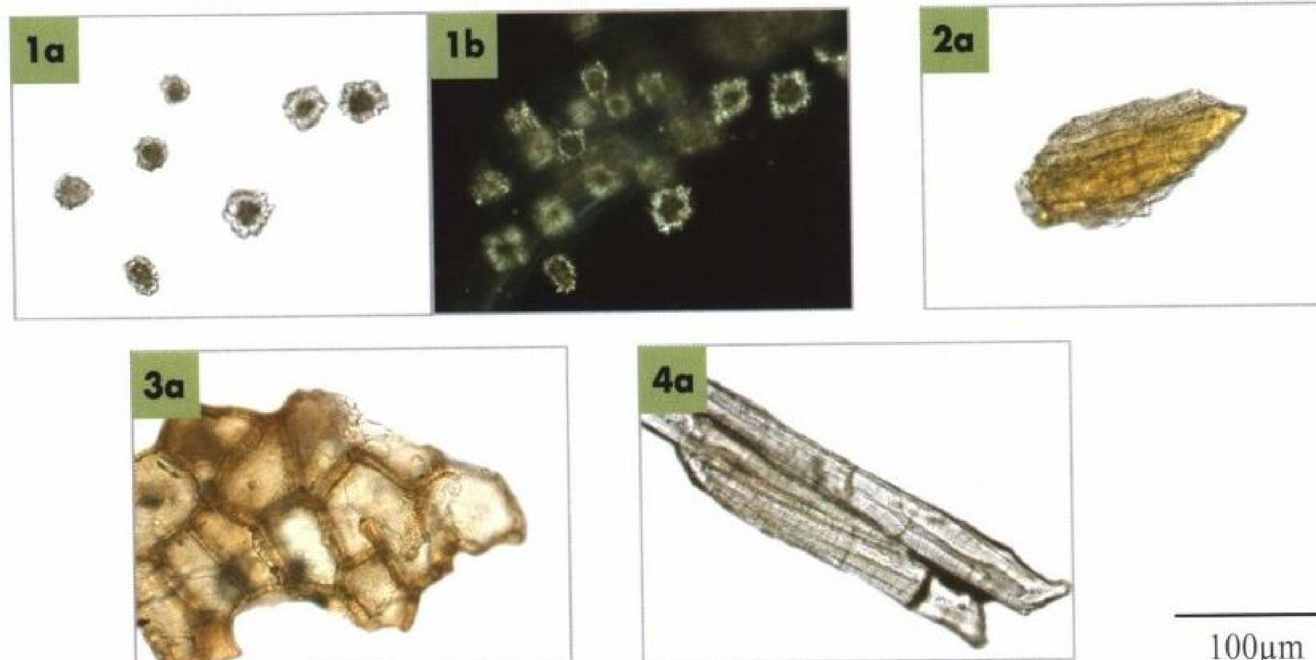
Transverse section of root bark

1. Cork	Several layers of suberized cells.
2. Cortex	Narrow.
3. Clefts	Scattered in the outer part of phloem.
4. Phloem	Broad; clefts in the outer part and rays 1~5 cells wide.
5. Clusters of calcium oxalate	Abundant; located in the parenchymatous cells.
6. Secretory canals	Subrounded; surrounded by 4~15 secretory cells; showing pale yellow oil droplets before being stained.

根皮横切面组织图注

1. 木栓层	为数列细胞，木栓化。
2. 皮层	窄。
3. 裂隙	散在于韧皮部外侧。
4. 韧皮部	宽广，外侧有裂隙，射线宽1~5列细胞。
5. 草酸钙簇晶	众多，存在于薄壁细胞中。
6. 分泌道	类圆形，周围分泌细胞4~15个，未染色前可见淡黄色油滴。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Clusters of calcium oxalate	Present in parenchymatous cells or scattered; 8~76μm in diameter; angles large and blunt while some short and sharp. Crystal cells subsquare in which several clusters longitudinally connected.
2. Secretory canals	Fragments easily seen in the longitudinal section; but occasionally seen in the transverse section; secretory cells and the canals containing pale yellow secretions and colorless oil droplets.
3. Cork cells	Pale yellow or pale yellowish-brown; subpolygonal or subsquare on the surface view; with thin walls.
4. Phloem fibres	Present in single or 2~4 fibres in a bundle; long strip in shape with straight or slightly wavy margins; the endings blunt, short sharp or truncate; 126~256μm in length and 14~44μm in diameter; the walls lignified and 3~9μm in thickness; pits loosely occurred.

图注

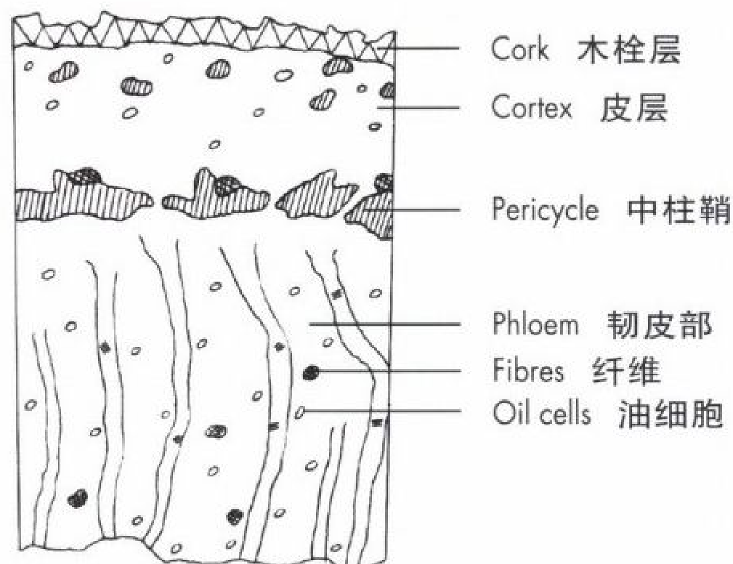
1. 草酸钙簇晶	存在于薄壁细胞中或散在，直径8~76μm，棱角较大而钝，也有的短而尖；有的含晶细胞类方形，常数个纵向相接，簇晶排列成行。
2. 分泌道	纵断面碎片易见，横断面偶见。分泌细胞及管道中含淡黄色分泌物以及无色油滴。
3. 木栓细胞	淡黄色或淡黄棕色。表面观类多角形或类方形，壁薄。
4. 韧皮纤维	单个散离或2~4个成束。呈长条形，平直，边缘稍波状，末端钝圆、短尖或平截，长126~256μm，直径14~44μm，壁厚3~9μm，木化，纹孔较稀。

肉桂 Rougui

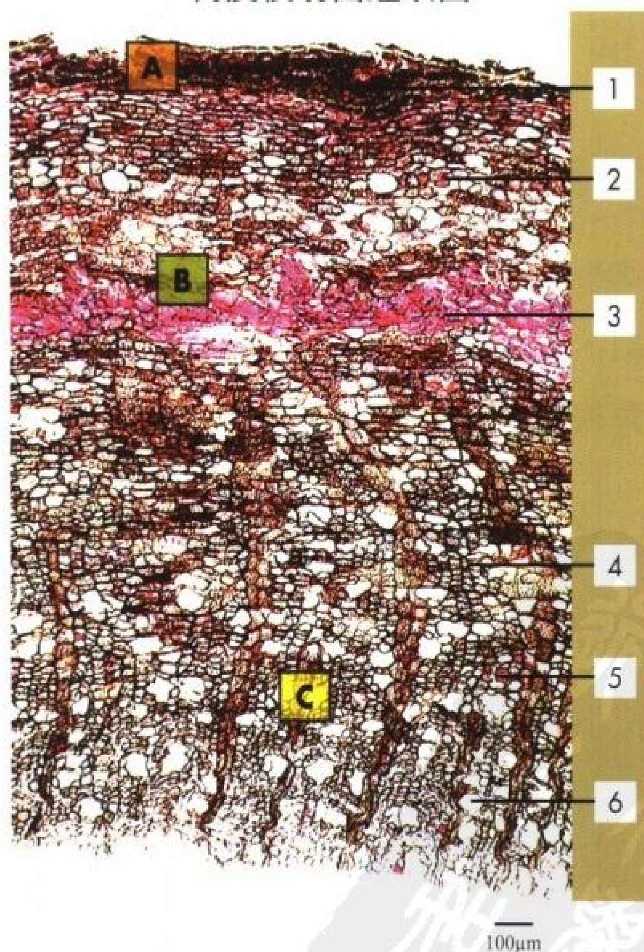


The dried stem bark of *Cinnamomum cassia* Presl. (Fam. Lauraceae).
樟科植物肉桂的干燥树皮。

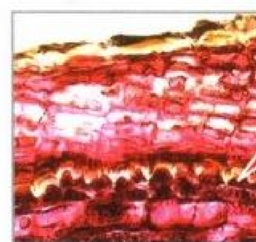
Sketch of transverse section of stem bark 树皮横切面简图



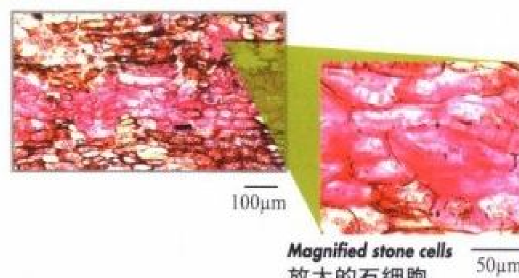
Transverse section of stem bark 树皮横切面组织图



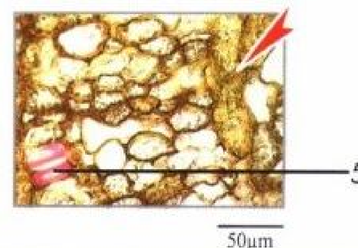
A Cork - "↗" Showing the cork cells inside
木栓层（'↗'示最内层木栓细胞）



B Groups of stone cells at pericycle
中柱鞘部位的石细胞群



C Phloem - "↗" Showing cells of rays containing raphides of calcium oxalate
韧皮部（'↗'示射线细胞含草酸钙针晶）



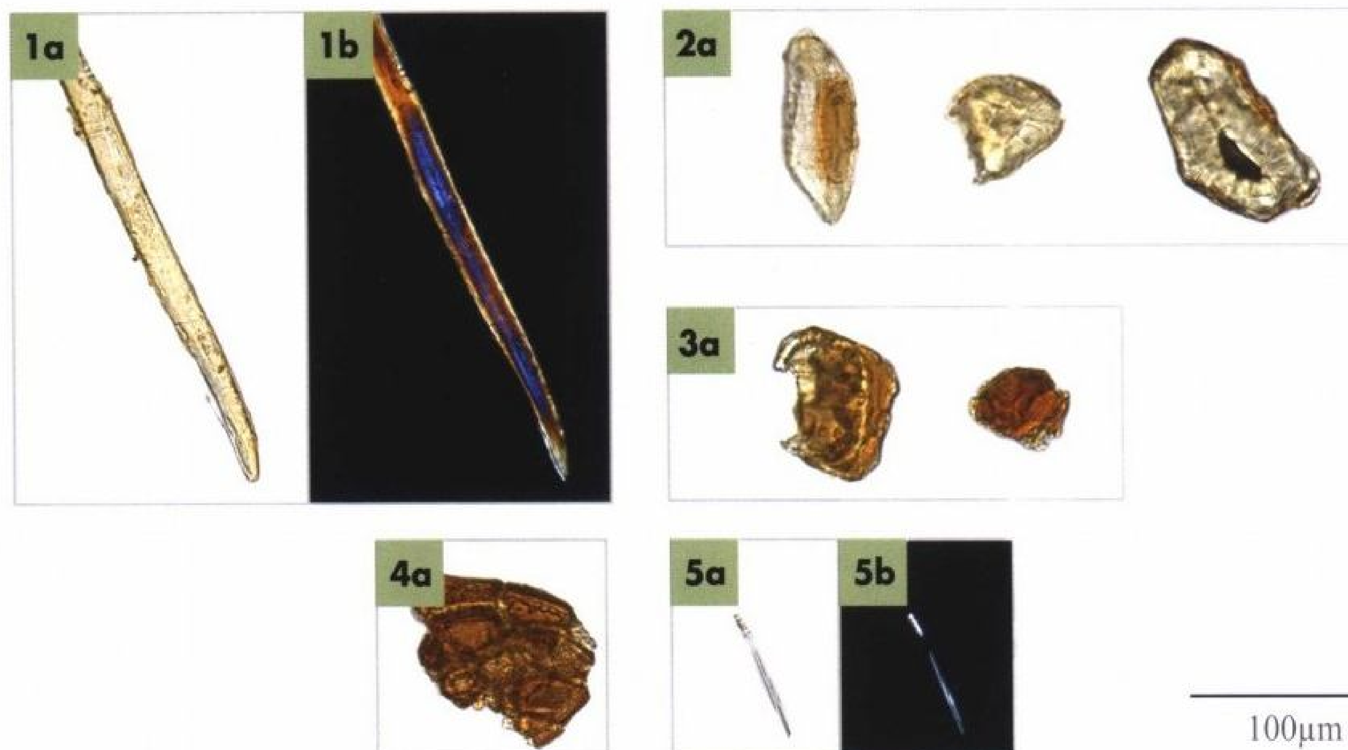
Transverse section of stem bark

1. Cork	Several rows of cells; the innermost layer of cells with thickened and lignified outer walls.
2. Cortex	Scattered with stones cells and oil cells.
3. Pericycle	Stone cells in groups arranged in an interrupted ring; accompanied by fibre bundles outside; the outer walls of stone cells usually thin.
4. Phloem	rays 1~2 rows of cells wide; containing fine raphides of calcium oxalate.
5. Fibres	Usually 2~3 in bundles.
6. Oil cells	Scattered throughout.

树皮横切面组织图注

1. 木栓层	细胞数列，最内层细胞外壁增厚，木化。
2. 皮层	散有石细胞及油细胞。
3. 中柱鞘	有石细胞群，断续排列成环，外侧伴有纤维束，石细胞通常外壁较薄。
4. 韧皮部	射线宽1～2列细胞，含细小草酸钙针晶。
5. 纤维	常2~3个成束。
6. 油细胞	随处可见。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibres	Mostly singly scattered; long fusiform; 195~920μm in length and about 20~70μm in diameter; with thick and lignified walls; pits indistinct. Polychrome under a polarizing microscope.
2. Stone cells	Subrectangular or subrounded; 32~88μm in diameter; walls thickened and some with one thin side. Brightly orange in color observed under a polarizing microscope.
3. Oil cells	Subrounded or longrounded; 45~108μm in diameter.
4. Cork cells	Polygonal; containing reddish-brown mass.
5. Raphides of calcium oxalate	Relatively fine, in different length; scattered. Brightly yellowish-white in color observed under a polarizing microscope.

图注

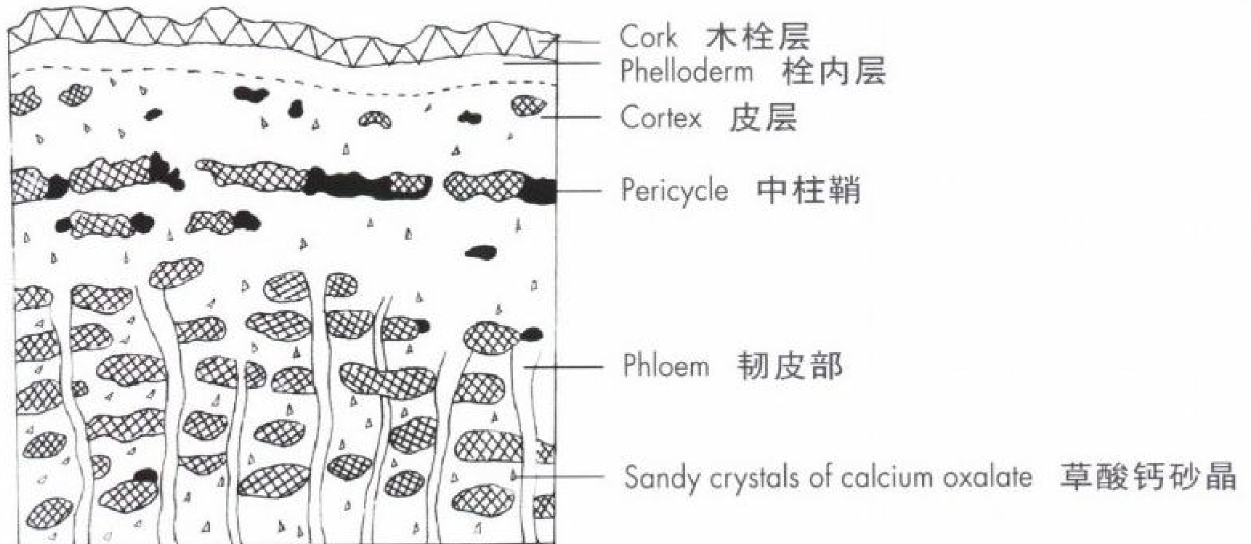
1. 纤维	大多单个散在，长梭形，长195~920μm，直径约20~70μm。壁厚，木化，纹孔不明显。偏光下多彩状。
2. 石细胞	类长方形或类圆形，直径32~88μm，壁厚，有的一面菲薄。偏光显微镜下呈亮橙黄色。
3. 油细胞	类圆形或长圆形，直径45~108μm。
4. 木栓细胞	多角形，含红棕色物。
5. 草酸钙针晶	较细小，长短不一，散在。偏光显微镜下呈亮黄白色。



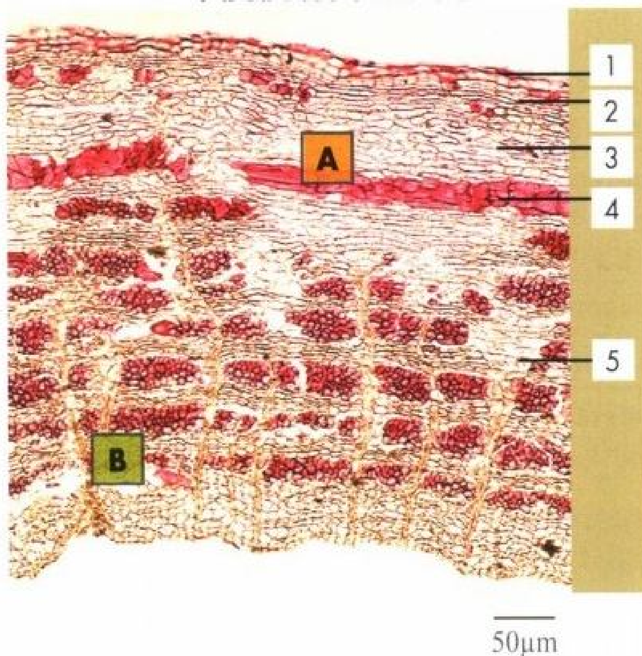
秦皮 Qinpi

The dried branch bark or stem bark of *Fraxinus rhynchophylla* Hance (Fam. Oleanaceae).
木犀科植物苦枥白蜡树的干燥枝皮或干皮。

Sketch of transverse section of stem bark
干皮横切面简图

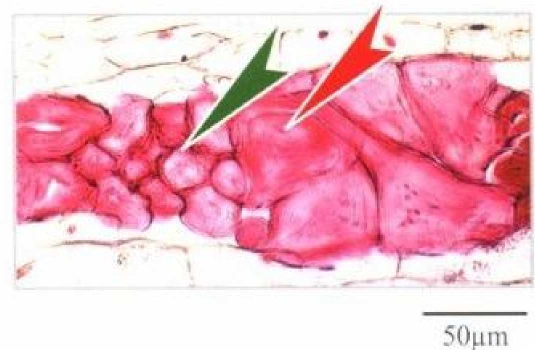


Transverse section of stem bark
干皮横切面组织图



50μm

A ***Stone cells "red arrow" and fibre bundles "green arrow"***
石细胞"红箭头"和纤维束"绿箭头"



50μm

B ***Fibre bundles and stone cells in phloem arranged into layers, penetrated with rays in "#"-shape***
韧皮部的纤维束及石细胞成层排列,中间贯穿射线,形成"井"字形



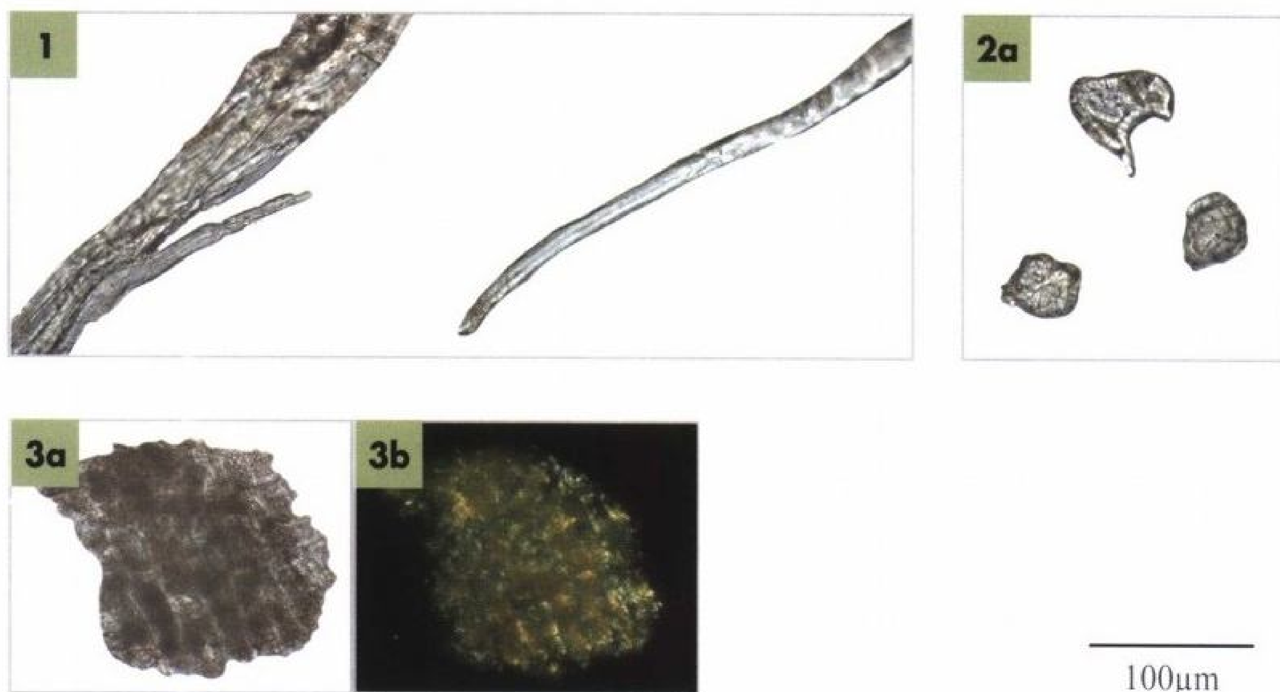
50μm

Transverse section of stem bark

1. Cork	Consisting of 5~10 rows of cells.
2. Phelloderm	Consisting of several rows of polygonal collenchymatous cells.
3. Cortex	Relatively broad, fibres and stone cells singly scattered or in groups.
4. Pericycle	Showing the ringed-band consisting of stone cells and fibre bundles, occasionally interrupted.
5. Phloem	Rays 1~3 rows of cells wide, fibre bundles and a few stone cells arranged into layers, penetrated with rays in "#"-shape.
6. Sandy crystals of calcium oxalate	Abundant, filling in parenchymatous cells.

干皮横切面组织图注

1. 木栓层	为5~10余列细胞。
2. 栓内层	为数列多角形厚角细胞。
3. 皮层	较宽，纤维及石细胞单个散在或成群。
4. 中柱鞘部位	有石细胞及纤维束组成的环带，偶有间断。
5. 韧皮部	射线宽1~3列细胞，纤维束及少数石细胞成层排列，中间贯穿射线，形成“井”字形。
6. 草酸钙砂晶	较多，填充于薄壁细胞中。



Notes

1. Fibers	Abundant; present in bundles or singly dispersed; quite long, mainly broken, straight or slightly curved; the margins sinuous and uneven; the walls lignified and extremely thick; pits unclear, the cellular lumina linear.
2. Stone cells	Abundant; present in groups or distributed singly; subround, subsquare, subrectangular, elliptical, subfusiform in shape; irregularly branched; the walls quite thick; pit canals clear.
3. Sandy crystals of calcium oxalates	Filled in various kinds of cells such as cortex, phloem parenchyma and ray cells; shape in fine fusiform or granular forms; length up to 3μm.

图注

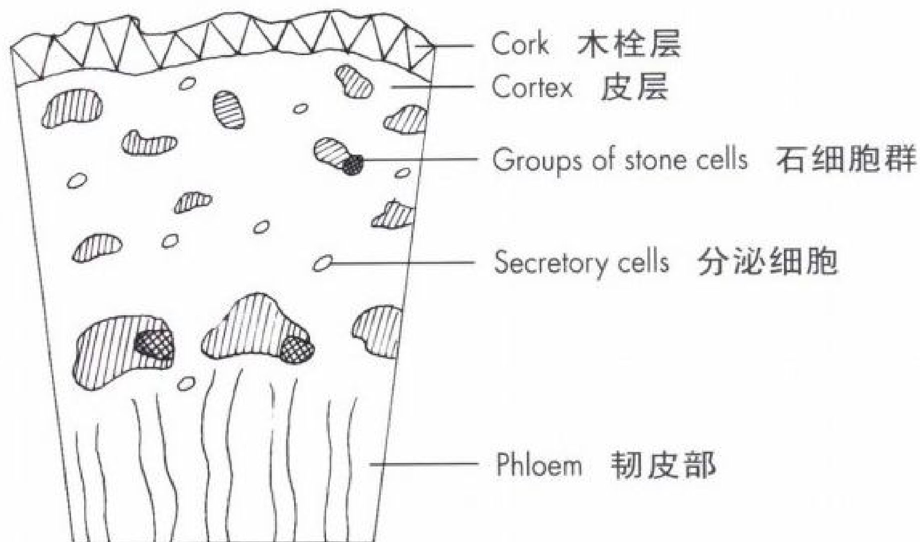
1. 纤维	较多，成束或散离。甚长，大多碎断，平直或稍弯曲，边缘微波状或凹凸，壁极厚，木化，纹孔不明显，胞腔线形。
2. 石细胞	较多，成群或单个散离。呈类圆形、类方形、类长方形、椭圆形、类纺锤形并作不规则短分枝，壁甚厚，孔沟明显。
3. 草酸钙砂晶	充塞于皮层、韧皮薄壁细胞及射线细胞中，呈微细梭形、颗粒状，长约至3μm。

地枫皮 Difengpi

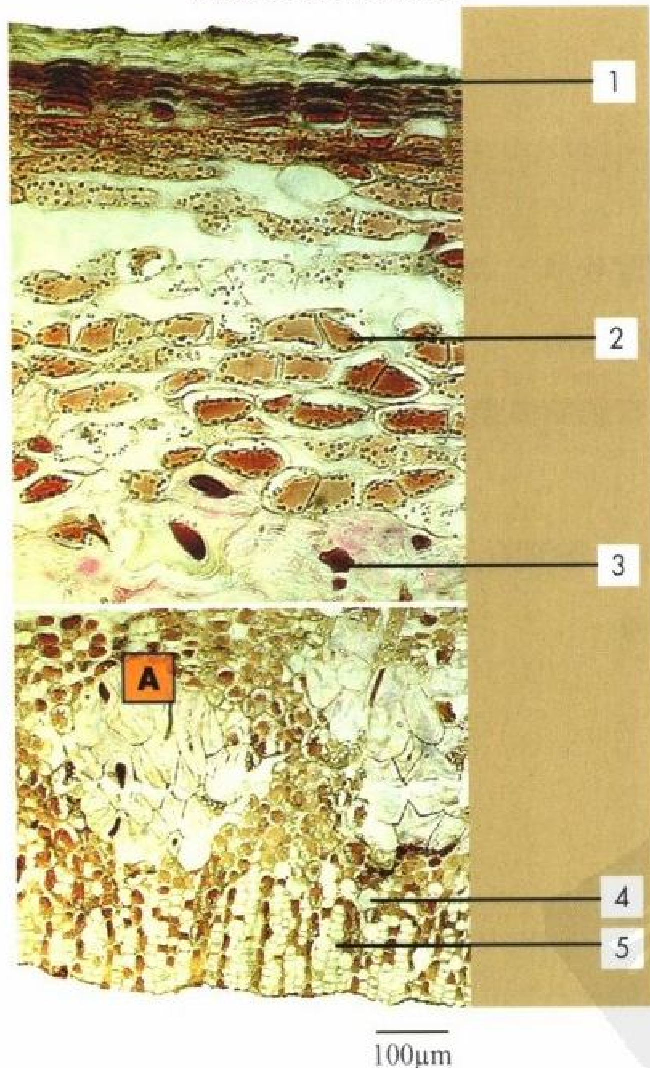


The dried stem bark of *Illicium difengpi* K. I. B. et K. I. M. (Fam. Magnoliaceae).
木兰科植物地枫皮的干燥树皮。

Sketch of transverse section of stem bark
树皮横切面简图



Transverse section of stem bark
树皮横切面组织图



A *Stone cells " " inlade with few fibre bundles " "*
石细胞群 " " 嵌有少数纤维束 " "



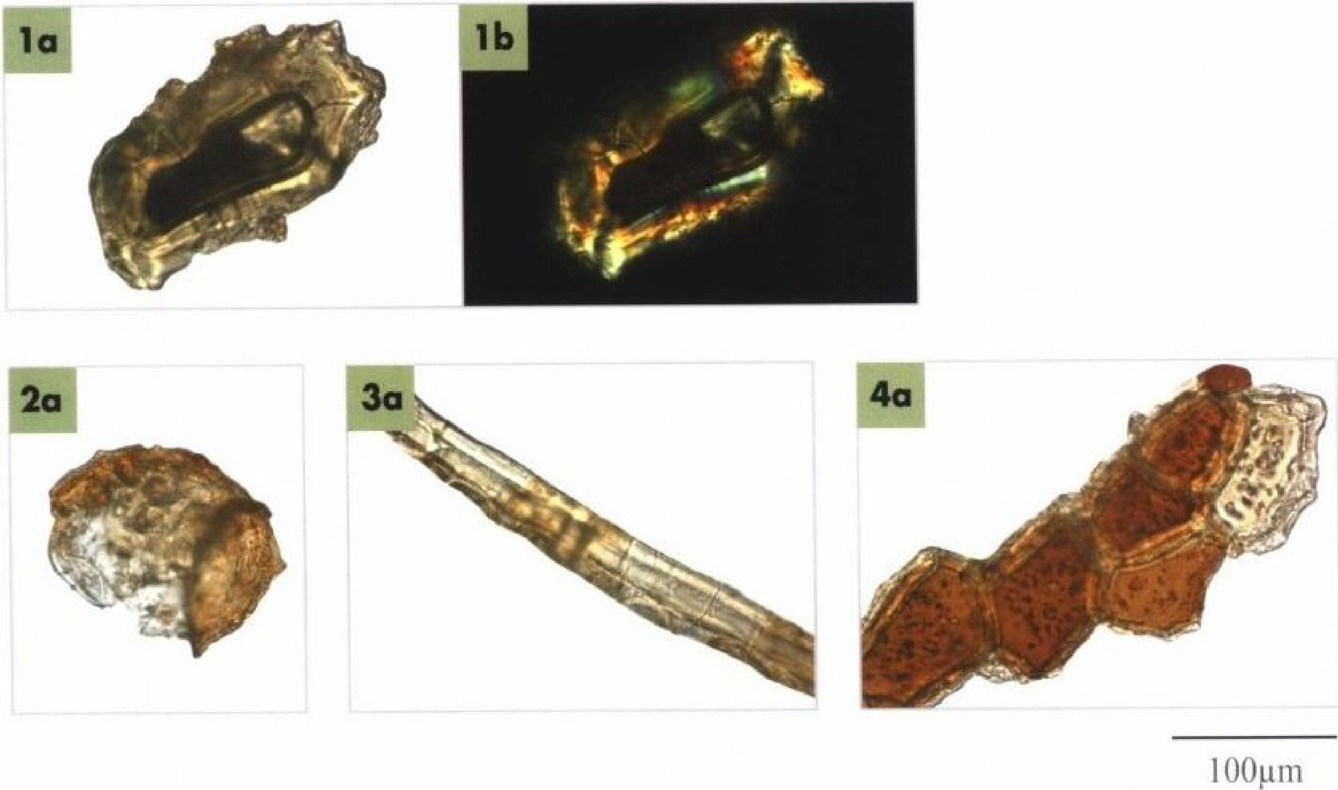
Transverse section of stem bark

1. Cork	Consisting of several rows of cells; the inner walls relatively thick; containing reddish-brown contents.
2. Cortex	Scattered with groups of stone cells and secretory cells.
3. Groups of stone cells	Inlade with a few fibre bundles; stone cells polygonal, striations distinct.
4. Secretory cells	Scattered.
5. Phloem	Rays 1 row of cells, and also showing secretory cells, but smaller than those in cortex.
Parenchymatous cells	Containing reddish-brown contents and starch granules.

树皮横切面组织图注

1. 木栓层	为数列细胞，其内壁较厚，含红棕色物。
2. 皮层	散有石细胞群及分泌细胞。
3. 石细胞群	嵌有少数纤维束；石细胞多角形，层纹明显。
4. 分泌细胞	散在。
5. 韧皮部	射线细胞1列；亦有分泌细胞，较皮层为小。
薄壁细胞	含红棕色物和淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells	Abundant; size various; subrectangular, subpolygonal or subfusiform; size of the cellular lumina various, containing yellowish-brown contents; pits canals and striations visible.
2. Secretory cells	Subrounded or elliptical, 120~140μm in diameter.
3. Fibres	Long fusiform in shape, the cellular lumina narrow and small.
4. Cork cells	Rectangular or polygonal in shape; 50~75μm in diameter; the walls thick and up to 8μm in thickness.

图注

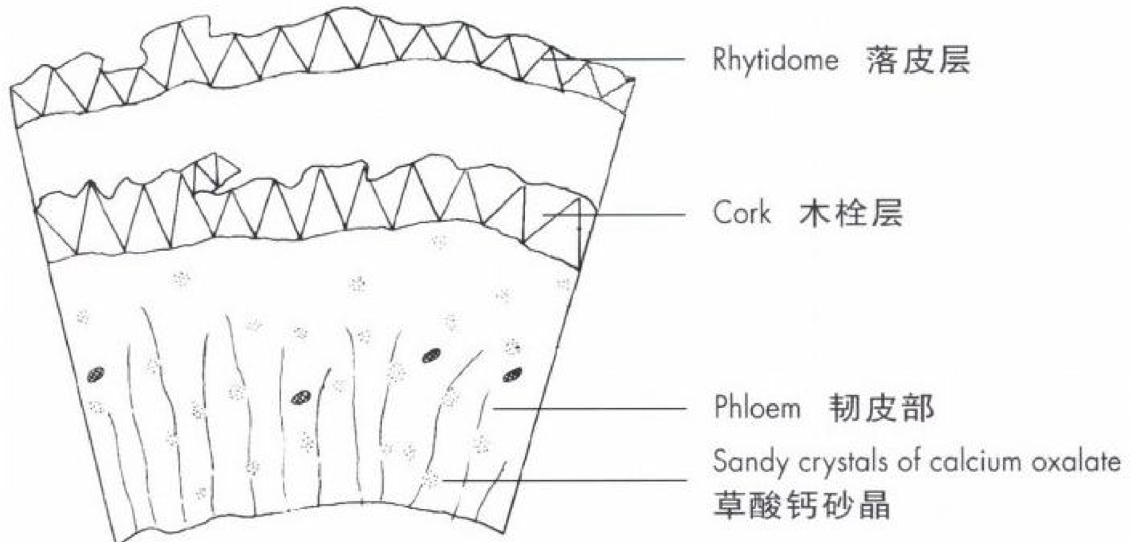
1. 石细胞	较多，大小不一，类长方形、类多角形或类梭形，胞腔大小不一，常含黄棕色内含物，可见孔沟及层纹。
2. 分泌细胞	近圆形或椭圆形，直径120~140μm。
3. 纤维	长梭形，胞腔窄小。
4. 木栓细胞	长方形或多角形，直径50~75μm，壁较厚，约至8μm。



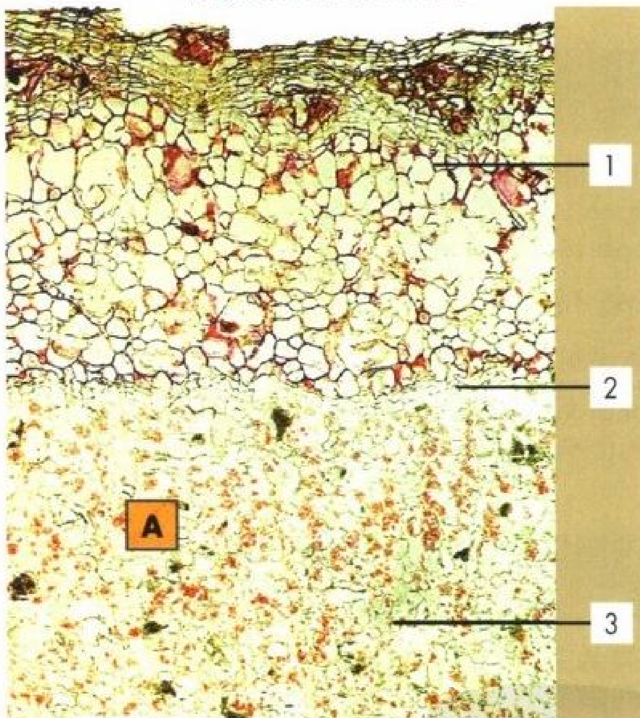
地骨皮 Digupi

The dried root bark of *Lycium chinense* Mill. (Fam. Solanaceae).
茄科植物枸杞的干燥根皮。

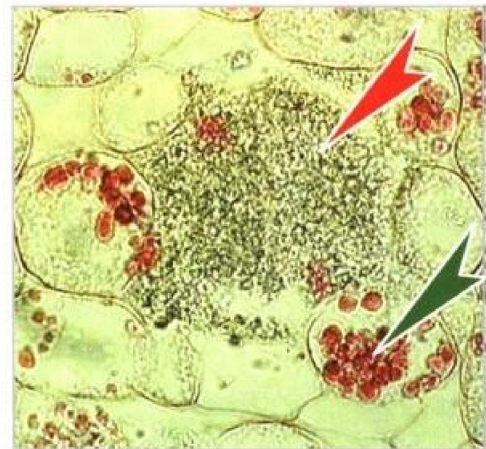
Sketch of transverse section of root bark
根皮横切面简图



Transverse section of root bark
根皮横切面组织图



A ***Parenchymatous cells containing sandy crystals of calcium oxalate "red arrow" and starch granules "green arrow"***
薄壁细胞含有草酸钙砂晶"红箭头"和淀粉粒"绿箭头"



Transverse section of root bark

1. Rhytidome	Relatively thick.
2. Cork	Consisting of 4~10 or even more rows of cells.
3. Phloem	Most phloem rays 1 row of cells wide; fibres singly scattered, or 2 to several in bundles.
Parenchymatous cells	Containing sandy crystals of calcium oxalate and numerous starch granules.

根皮横切面组织图注

1. 落皮层	较厚。
2. 木栓层	为4~10余列细胞。
3. 韧皮部	射线大多宽1列细胞；纤维单个散在或2至数个成束。
薄壁细胞	含草酸钙砂晶，并含多数淀粉粒。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Sandy crystals of calcium oxalate	Scattered or appeared in parenchyma, extremely tiny, slightly arrowhead-like in shape; some parenchymaotus cells full of sandy crystal sacs formed from the crystals.
2. Fibres	Pale yellow in color, ususlly dispersed singly or few present in bundles, often connected with ray cells, fusiform in shape; yellowish-brown contents in some cellular lumina.
3. Phloem rays	One row of cell in width, 8~13 cells in height; cell walls thin.
4. Starch granules	Abundant; single granules subrounded or elliptical; helium dotted or V-shaped, striations unclear; compound granules composed of 2~8 components. Dark "+" form observed under polarizing microscope.

图注

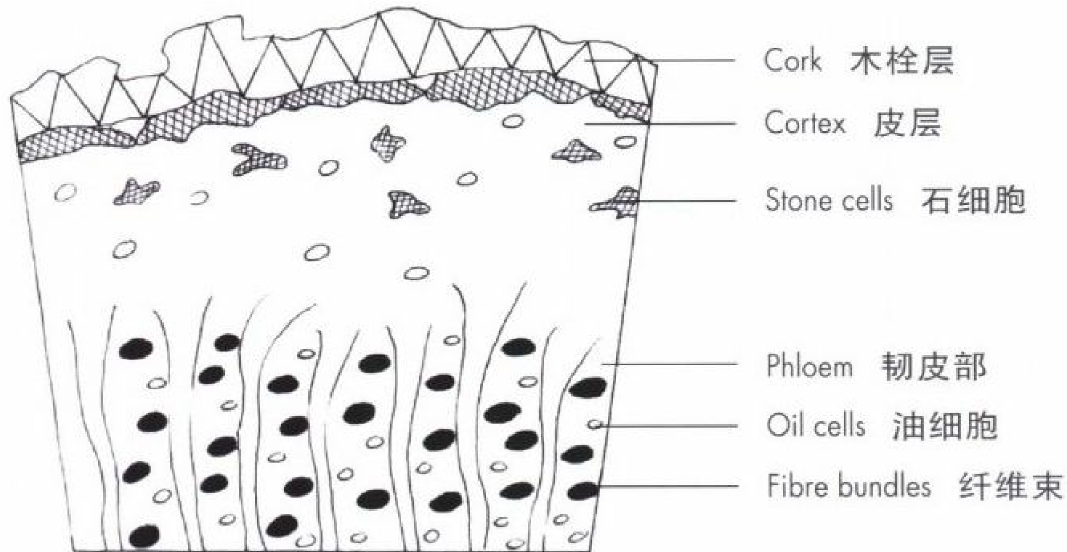
1. 草酸钙砂晶	散在或存在于薄壁细胞中，极微细，略呈箭头形。有的薄壁细胞充满砂晶形成的砂晶囊。
2. 纤维	淡黄色，多单个散在，或少数成束，常与射线细胞相连，梭形或纺锤形，有的胞腔内含黄棕色物。
3. 韧皮射线	宽1列细胞，高8~13个细胞，壁薄。
4. 淀粉粒	极多。单粒类圆形或椭圆形，脐点点状或人字形，层纹不明显；复粒由2~8分粒组成，偏光下可见黑"十"字。

Cortex Magnoliae Officinalis

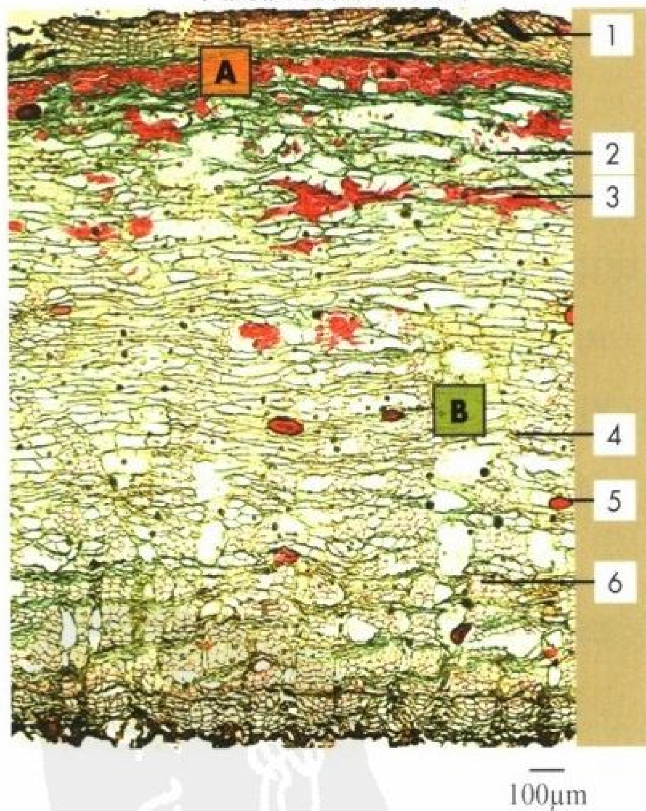
厚朴 Houpo

The dried stem bark of *Magnolia officinalis* Rehd. et Wils. (Fam. Magnoliaceae).
木兰科植物厚朴的干燥干皮。

Sketch of transverse section of stem bark
干皮横切面简图



Transverse section of stem bark
干皮横切面组织图



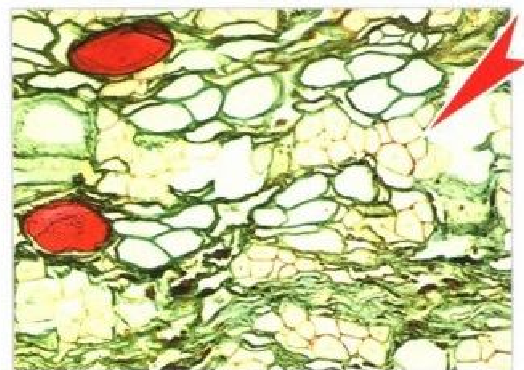
100μm

A *Cork and cortex*
木栓层和皮层



50μm

B *Phloem*
韧皮部



50μm

Transverse section of stem bark

1. Cork	Consisting of over 10 rows of cells. (Occasionally rhytidome visible)
2. Cortex	The outer side of cortex showing a ring of stone cells, and the inner side scattered with numerous oil cells and groups of stone cells.
3. Stone cells	In the form of polygon or antler, walls thick.
4. Phloem	Rays 1~3 rows of cells wide; fibres mostly several in bundles; and oil cells scattered also.
5. Oil cells	Numerous, scattered distribution.
6. Fibre bundles	Phloem fibers densely arranged, 2~38 fibers aggregated in one group, alternately arranged with sieve vessel parenchymatous cells.

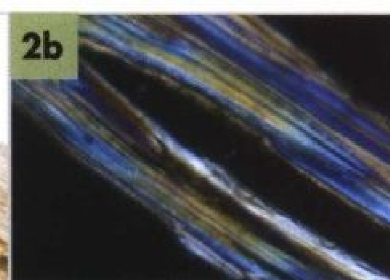
干皮横切面组织图注

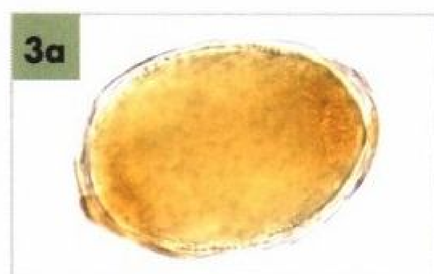
1. 木栓层	为10余列细胞（有时可见落皮层）。
2. 皮层	外侧有石细胞环带，内侧有多数油细胞及石细胞群。
3. 石细胞	呈多角形、鹿角状，壁厚。
4. 韧皮部	射线宽1~3列细胞；纤维多数个成束；亦有油细胞散在。
5. 油细胞	多数，散列。
6. 纤维束	韧皮纤维分布密集，由2~38个纤维相聚成群，与筛管薄壁细胞相间排列。

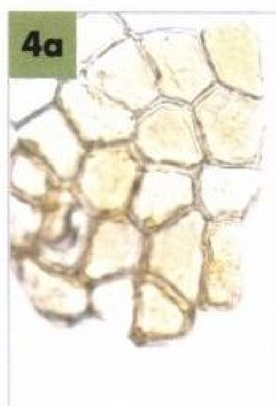
Main Powder Characteristics
主要粉末显微特征

1a


2a


2b


3a


4a


5a


50μm

Notes

1. Stone cells	Numerous, some of cells subsquare, long-rounded or ovate, 7~65μm in diameter, and some of cells irregualarly branched, nearly up to 300μm long, sometimes pit cannals and striations visible.
2. Fibres	Numerous, very long, mostly broken, 7~32μm in diameter, walls strongly thickened, lignified. Bright polychrome can be observed under a polarizing microscope.
3. Oil cells	Elliptical or subrounded, 22~129μm in diameter.
4. Cork cells	Yellowish-brown, polygonal in surface view.
5. Prisms of calcium oxalate	Rare, prismatic or polyhedral.

图注

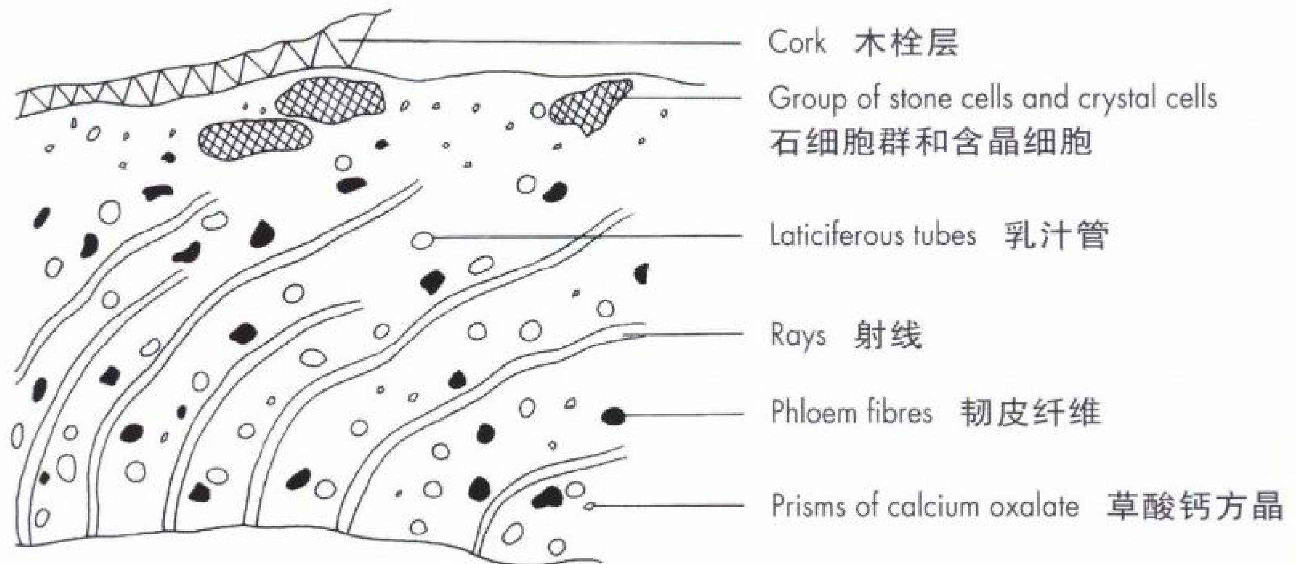
1. 石细胞	较多，类方形、长圆形或卵圆形者直径7~65μm，不规则分支状者长约至300μm，有时可见纹孔层纹。
2. 纤维	较多，颇长，大多碎断，直径7~32μm，壁极厚，木化。偏光显微镜下呈亮多彩状。
3. 油细胞	椭圆形或类圆形，直径22~129μm。
4. 木栓细胞	黄棕色，表面观类多角形。
5. 草酸钙方晶	稀少，呈棱柱状或多面体形。

桑白皮 Sangbaipi

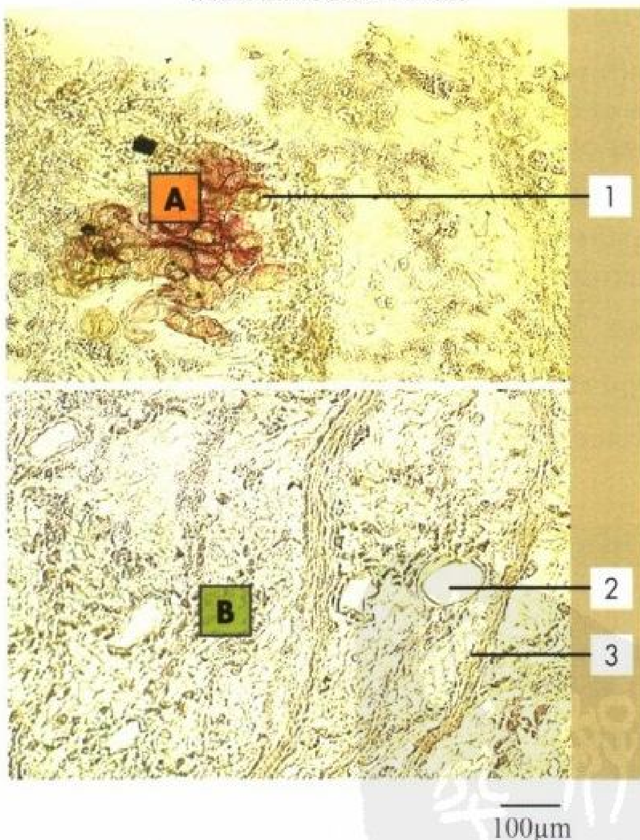


The dried root bark of *Morus alba* L. (Fam. Moraceae).
桑科植物桑的干燥根皮。

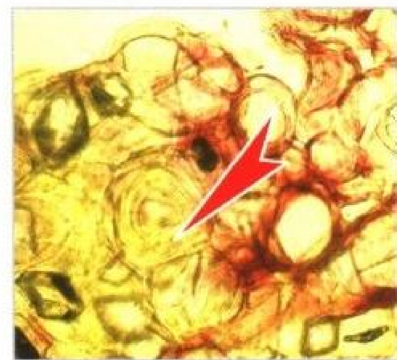
Sketch of transverse section of root bark
根皮横切面简图



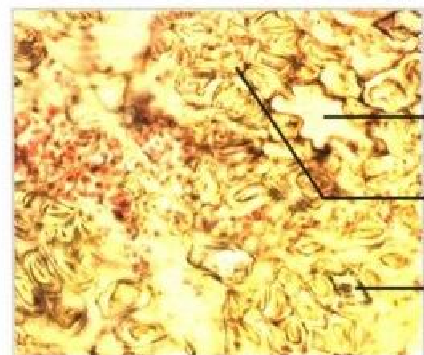
Transverse section of root bark
根皮横切面组织图



A *The groups of scleranchymatous cells mixed with stone cells*
夹有石细胞的厚壁细胞群



B *Fibres, laticiferous tubes and prisms of calcium oxalate*
纤维、乳管与草酸钙方晶



Transverse section of root bark

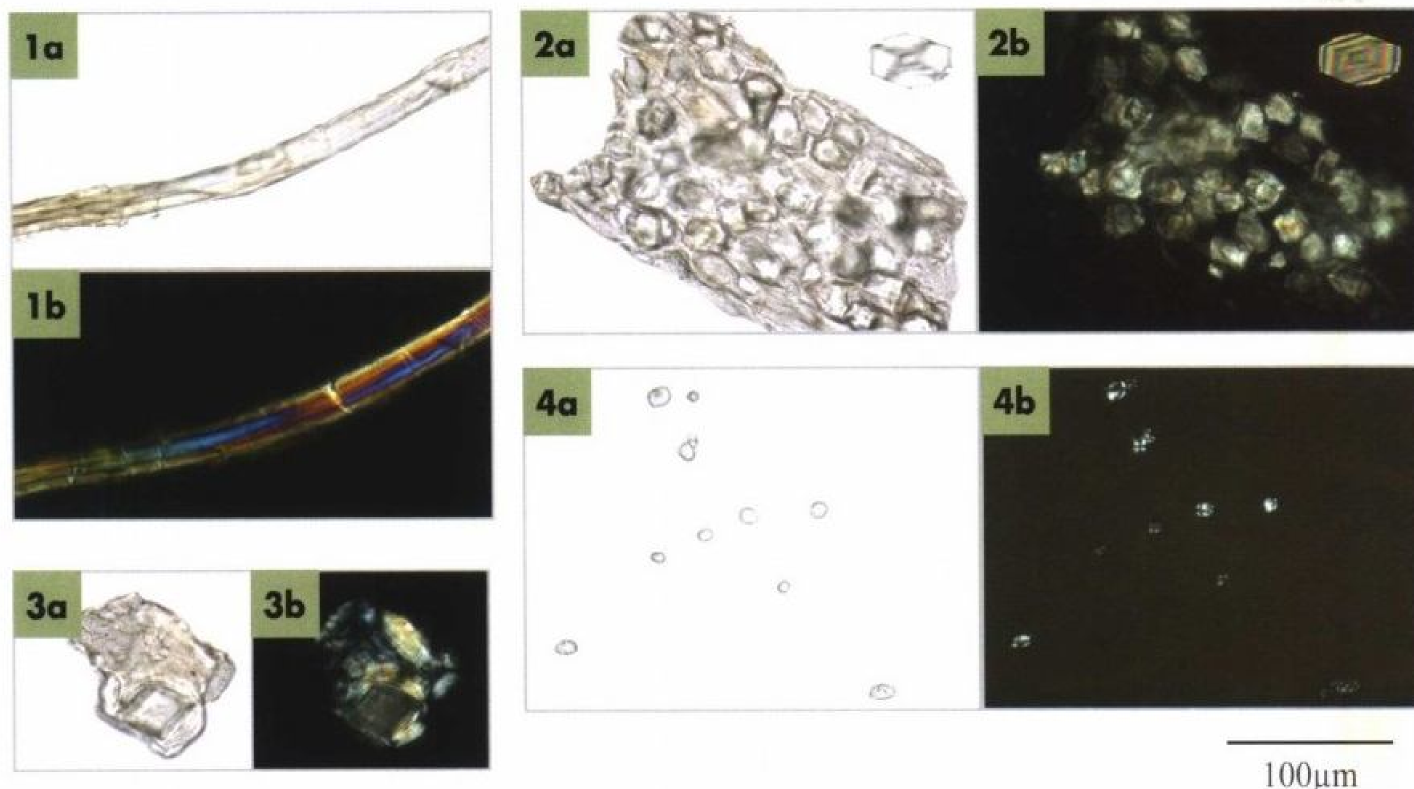
1. The groups of scleranchymatous cells mixed with stone cells	Scattered in the older root bark; most lumina containing prisms of calcium oxalate.
2. Laticiferous tubes	Scattered in phloem.
3. Phloem rays	2~6 rows of cells wide.
4. Fibres	Scattered singly or in bundles; unlignified or slightly lignified.
5. Prisms of calcium oxalate	Scattered in parenchymatous cells.

根皮横切面组织图注

1. 夹有石细胞的厚壁细胞群	存在于较老的根皮中，胞腔内大多含草酸钙方晶。
2. 乳汁管	散在于韧皮部。
3. 韧皮部射线	宽2~6列细胞。
4. 纤维	单个或成束，非木化或微木化。
5. 草酸钙方晶	散在于薄壁细胞中。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibres	Numerous; mostly broken; 13~26μm in diameter; with thick walls non-lignified to slightly lignified; pit canals indistinct.
2. Crystals of calcium oxalate	Prisms scattered; 11~32μm in diameter. Brightly white color separated by blue under a polarizing microscope.
3. Stone cells	Subrounded; subsquare or irregularly shaped; 22~52μm in diameter; with relatively or extremely thickened walls; pits and pit canals distinct; lumina usually containing prisms. Both walls of stone cells and crystals appearing brightly yellowish-white color under a polarizing microscope.
4. Starch granules	Numerous and subrounded; 4~16μm in diameter.

图注

1. 纤维	甚多，多碎断，直径13~26μm，壁厚，非木化至微木化，孔沟不明显。
2. 草酸钙结晶	方晶散在，直径11~32μm。偏光显微镜下结晶呈亮白色间蓝色。
3. 石细胞	类圆形、类方形或不规则形，直径22~52μm，壁较厚或极厚，纹孔及孔沟明显，胞腔内常含方晶。偏光显微镜下石细胞壁及结晶均呈亮黄白色。
4. 淀粉粒	甚多，类圆形，直径4~16μm。

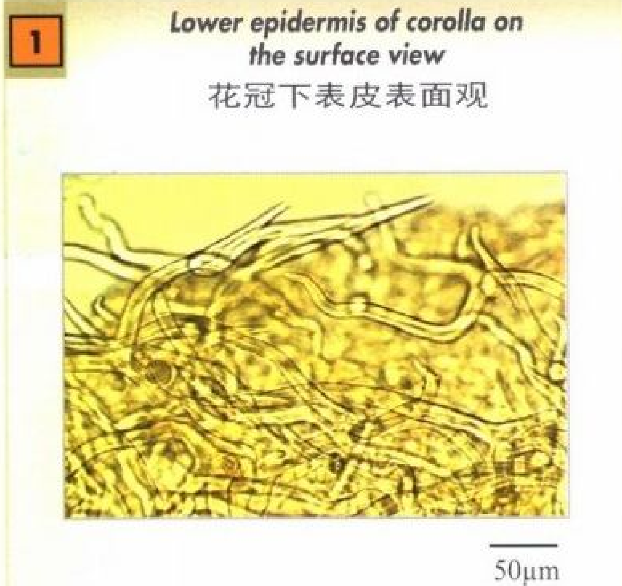
Flos Buddlejae

密蒙花 Mimenghua

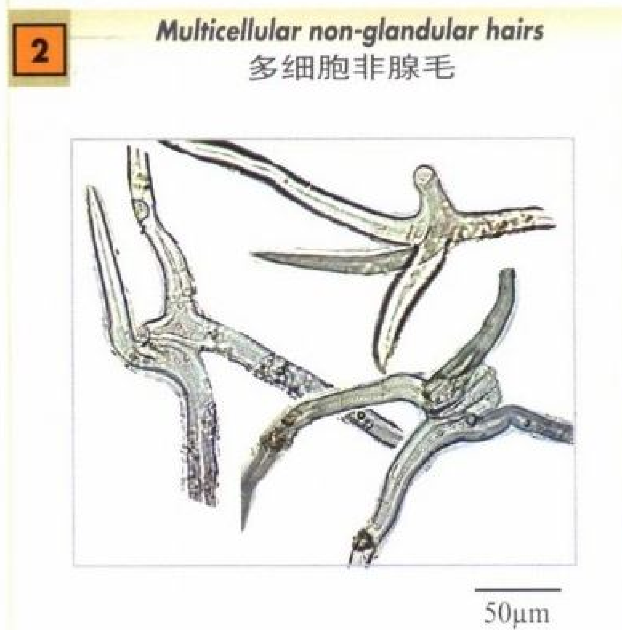


The dried flower bud and the inflorescence of *Buddleja officinalis* Maxim. (Fam. Loganiaceae).
马钱子科植物密蒙花的干燥花蕾及其花序。

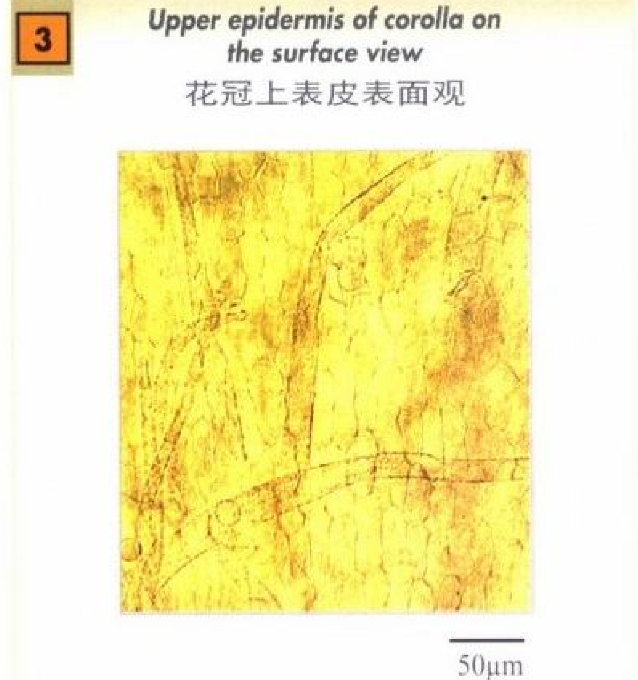
1 ***Lower epidermis of corolla on the surface view***
花冠下表皮表面观



2 ***Multicellular non-glandular hairs***
多细胞非腺毛



3 ***Upper epidermis of corolla on the surface view***
花冠上表皮表面观



4 ***Unicellular non-glandular hairs***
单细胞非腺毛



5 ***Pollen grains***
花粉粒



Surface view of calyx and corolla

1. Lower epidermis	Densely covered with non-glandular hairs.
2. Multicellular non-glandular hairs	Usually 4-celled; at the base 2-celled, uniseriate; at the apex 2- celled, juxtaposed, each cell branched, each fork 250~500μm long; walls extremely thick, lumina linear.
3. Upper epidermis of corolla	With a few unicellular non-glandular hairs.
4. Unicellular non-glandular hairs	200~600μm long, walls with numerous spiny tubercles.
5. Pollen grains	Spherical, 13~20μm in diameter, exine smooth, with 3 germinal pores.

花萼及花冠表面观组织图注

1. 下表面	密被非腺毛。
2. 多细胞非腺毛	通常为4细胞，基部2细胞单列，上部2细胞并列，每细胞又分叉，每分叉长250~500μm，壁极厚，胞腔线形。
3. 花冠上表面	有少数单细胞非腺毛。
4. 单细胞非腺毛	长200~600μm，壁具多数刺状突起。
5. 花粉粒	球形，直径13~20μm，表面光滑，有3个萌发孔。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Stellate hairs	Easily observed, mostly broken; complete hairs at the base 2-celled, juxtaposed; each cell bifurcate at upper part, tetrafurcate of entirety; walls very thick and lumina linear.
2. Non-glandular hairs	Unicellular, walls with numerous spiny protuberance.
3. Pollen grains	Globular, superficial ornamentations indistinct, with 3 germinal pores.
4. Glandular hairs	Head 2-celled and juxtaposed on the top view, stalk short and composed of 1~2 cells.

图注

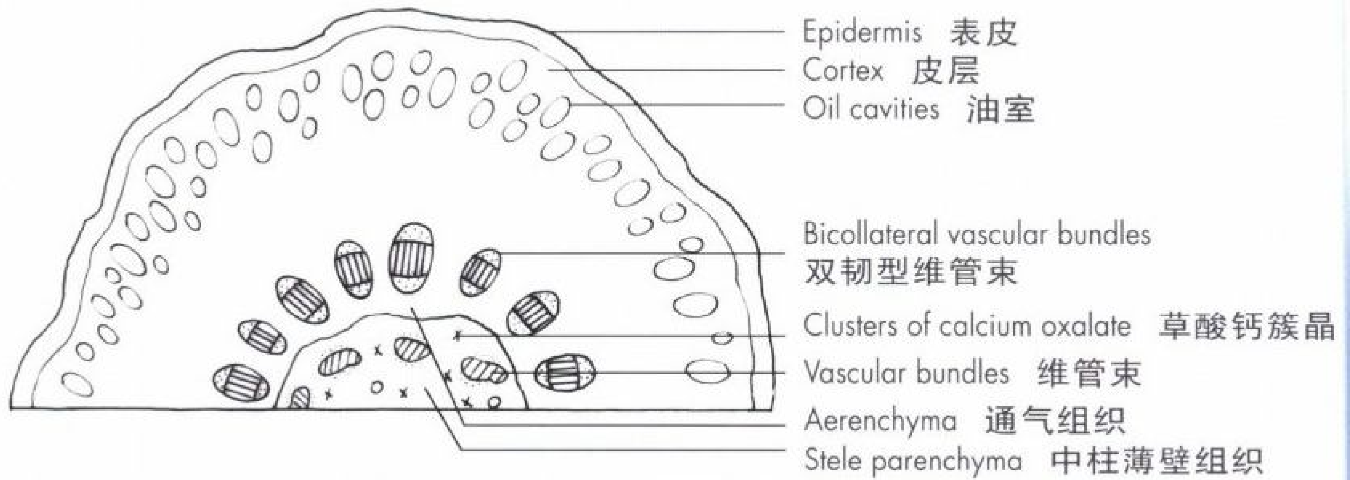
1. 星状毛	易见，多破碎，完整者基部2细胞并列，每细胞上部分2叉，合成4分叉状，壁甚厚，胞腔线形。
2. 非腺毛	单细胞，壁具多数刺状突起。
3. 花粉粒	球形，表面纹饰不明显，具3个萌发孔。
4. 腺毛	头部顶面观2个细胞并列，柄部短，1~2个细胞。

丁香 Dingxiang

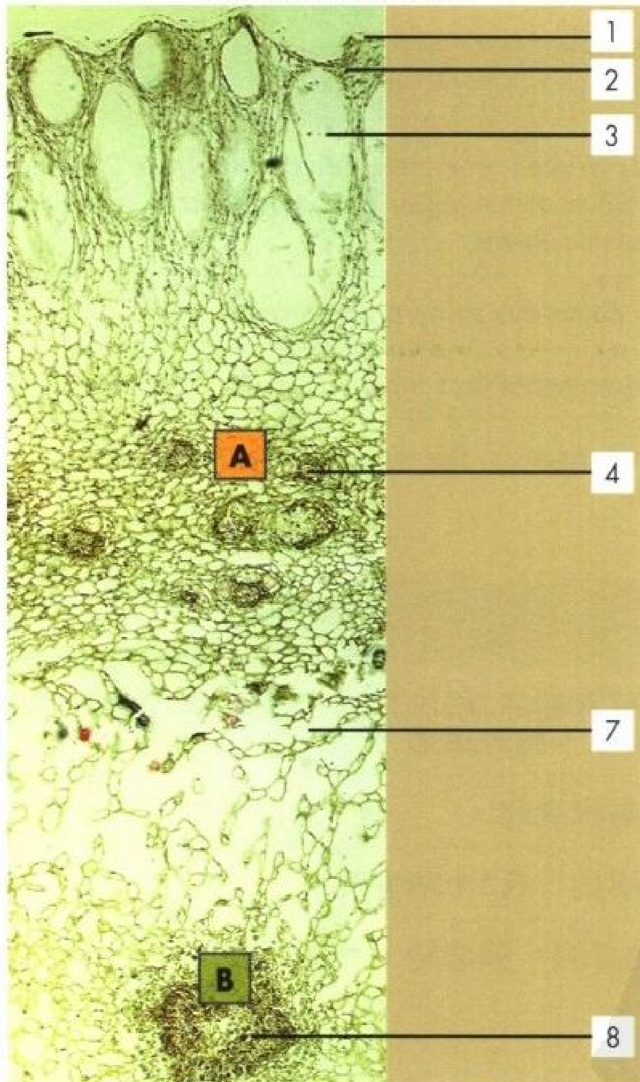


The dried flower bud of *Eugenia caryophyllata* Thunb. (Fam. Myrtaceae).
桃金娘科植物丁香的干燥花蕾。

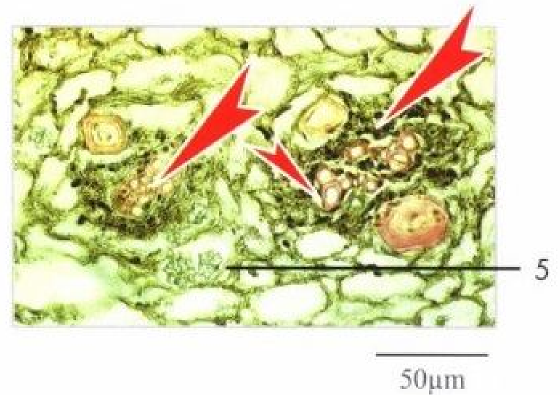
Sketch of transverse section of calyx tube
萼筒横切面简图



Transverse section of calyx tube
萼筒横切面组织图



A Small bicollateral vascular bundles
小型的双韧型维管束



B Stele parenchyma
中柱薄壁组织



Transverse section of flower bud

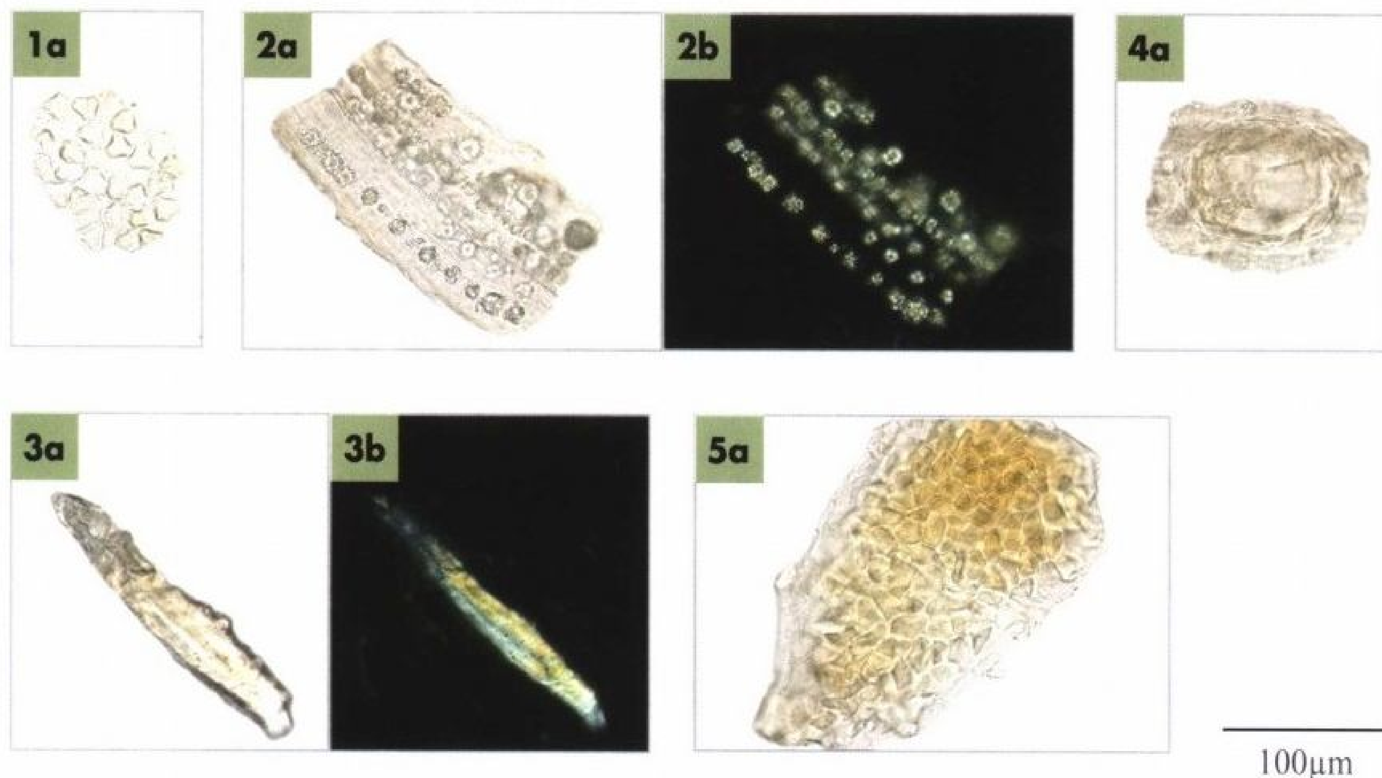
1. Epidermis	1 row of cells; with a thickened cuticle.
2. Cortex	2~3 rows of elliptical oil cavities; radially elongated; 150~200μm in diameter; scattered towards the outside.
3. Oil cavities	Boundary of secretory cells unclear; containing pale yellow oily contents.
4. Bicollateral bascular bundles	20~50 vascular bundles; arranged in an interrupted ring.
5. Clusters of calcium oxalate	Numerous and fine; scattered in the parenchymatous cells.
6. Vascular bundles	Surrounded by few fibres outside; with thickened and lignified walls.
7. Aerenchyma	Consisting of several layers of parenchymatous cells arranged reticulated; with large intercellular spaces.
8. Stele parenchyma	Numerous and small vascular bundles scattered inside.

花蕾横切面组织图注

1. 表皮	1列细胞，有较厚的角质层。
2. 皮层	外侧散有2~3列径向延长的椭圆形油室，直径150~200μm。
3. 油室	分泌细胞界限不清，含淡黄色油状物。
4. 双韧型维管束	20~50个，断续排列成环。
5. 草酸钙簇晶	细小，较多，散在于薄壁细胞中。
6. 维管束	外侧有少数纤维，壁厚，木化。
7. 通气组织	由数列薄壁细胞组成，网状排列，有大型细胞间隙。
8. 中柱薄壁组织	散有多数细小维管束。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Pollen grains	Numerous; triangular in the polar view; double-convex lens shaped in the equatorial view; with 3 secondary connate canals.
2. Clusters of calcium oxalate	Numerous; mostly present in relatively small parenchymatous cells, several arranged in rows; commonly with sharp angles; 4~26μm in diameter.
3. Fibres	Fusiform; scattered or 2~3 aggregated in bundles; with blunt ends and relatively thickened walls; brim flat or undulant curved.
4. Oil cavities	Usually broken; boundary of secretory cells unclear; containing yellowish oily contents.
5. Receptacle epidermal cells	Subrounded or subrectangular on the surface view; anticlinal walls slightly thickened, undulant curved.

图注

1. 花粉粒	众多，极面观呈三角形，赤道面观成双凸镜形，具3副合沟。
2. 草酸钙簇晶	众多，大多数存在于较小的薄壁细胞中，数个排列成行，棱角大多尖锐，直径4~26μm。
3. 纤维	梭形，散在或2~3成束，顶端钝圆，壁较厚，边缘平整或波状弯曲。
4. 油室	常破碎，分泌细胞界限不清，含黄色油状物。
5. 花托表皮细胞	表面观类圆形或类长方形，垂周壁稍厚，波状弯曲。

芫花 Yuanhua

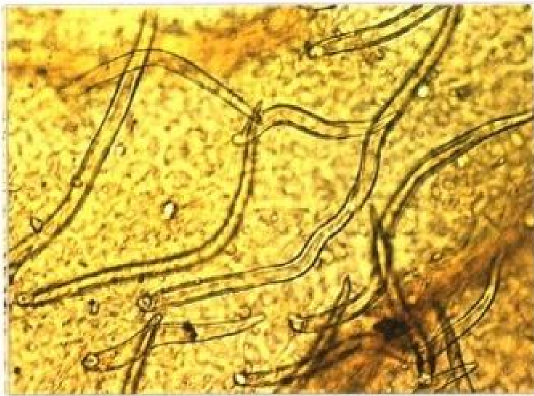


The dried flower bud of *Daphne genkwa* Sieb. et Zucc. (Fam. Thymelaeaceae).
瑞香科植物芫花的干燥花蕾。

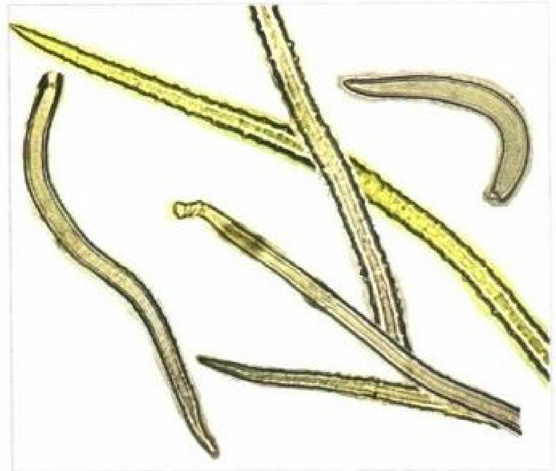
1 ***Pollen grains***
花粉粒



2 ***The lower epidermis of perianth***
花被下表皮



3 ***Non-glandular hairs***
非腺毛



Surface view of flower bud

1. Pollen grains	Yellow; subspherical; 23~45μm in diameter; with distinct reticulate sculptures.
2. The lower epidermis of perianth	With non-glandular hairs.
3. Non-glandular hairs	Unicellular and mostly curved; 88~780μm long and 15~23μm in diameter; with relatively thick walls and slightly warty protuberances.

花蕾表面观

1. 花粉粒	黄色，类球形，直径23~45μm，表面有较明显的网状雕纹。
2. 花被下表皮	有非腺毛。
3. 非腺毛	单细胞，多弯曲，长88~780μm，直径15 ~ 23μm，壁较厚，微具疣状突起。



Notes

1. Unicellular non-glandular hairs	Abundant; present singly or located in the epidermal cells of calyx and petal fragments; often curved; tips lanceolate sharp; 10~23μm in diameter and the walls thick. Another type of non-glandualr hairs straight but the walls bearing warty projections; T-shaped non-glandular hairs occasionally occurred.
2. Pollen grains	Pale yellow; spherical or ovate-spherical; 22~34μm in diameter; fine and dense granular projections on exine; germination apertures sometimes present.

图注

1. 单细胞非腺毛	众多。单个散在或存在于萼片及花瓣碎片的表皮上，多弯曲，先端渐尖，直径10~23μm，壁厚。另有一种非腺毛，较平直，壁具疣状突起；偶尔可见丁字形非腺毛。
2. 花粉粒	淡黄色，圆球形或卵球形，直径22~34μm，外壁具细密的颗粒状突起，有的可见萌发孔。

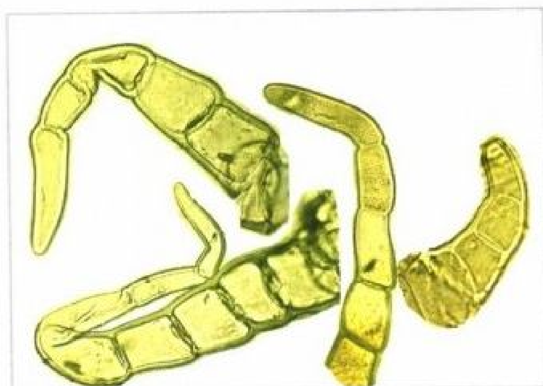


旋覆花 Xuanfuhua

The dried capitate inflorescence of *Inula japonica* Thunb. (Fam. Compositae)

菊科植物旋覆花的干燥头状花序。

1 ***Non-glandular hairs of bract***
苞片非腺毛



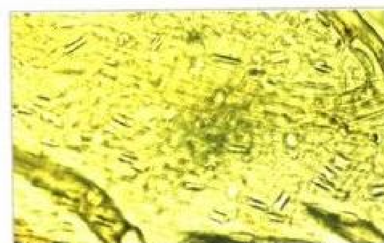
2 ***2-3 celled seriate non-glandular hairs***
2~3细胞并生非腺毛



3 ***Pappus***
冠毛



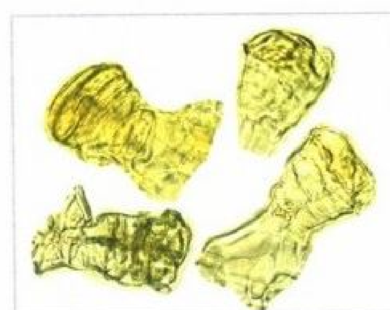
4 ***Epidermis cells of ovary***
子房表皮细胞



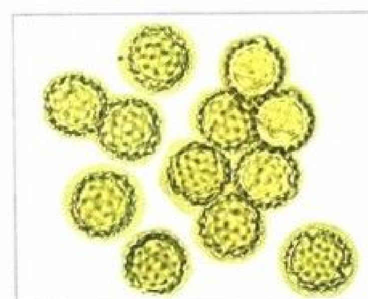
5 ***Non-glandular hairs of ovary***
子房非腺毛



6 ***Glandular hairs of bracts and corolla***
苞片和花冠腺毛



7 ***Pollen granules***
花粉粒



Surface view of inflorescence

1. Non-glandular hairs of bracts	1~8 cells, base of the multicellular ones large, and the apical cells very long.
2. 2~3 cells seriate non-glandular hairs	Located in inner layers of bracts
3. Pappus	Consisting of multiseriate non-glandular hairs, margin cells slightly convex.
4. Epidermal cells of ovary	Containing columnar crystals of calcium oxalate, up to 48μm long, 2~5μm in diameter.
5. Non-glandular hairs of ovary	Biseriated, one row unicellular and the other bicellular, 90~220μm long.
6. Glandular hairs	Consisting in the surface of bracts and corolla; clavate, with a multicellular head, mostly biseriate, surrounded by bursa of cutin; with a multicellular stalk, biseriate.
7. Pollen grains	Subspherical, 22~33μm in diameter; exine spiny, with 3 germinal pores.

花序表面观图注

1. 苞片非腺毛	1~8细胞，多细胞者基部膨大，顶端细胞特长。
2. 2~3细胞并生非腺毛	着生于内层苞片。
3. 冠毛	为多列性非腺毛，边缘细胞稍向外突出。
4. 子房表皮细胞	含草酸钙柱晶，长约至48μm，直径2~5μm。
5. 子房非腺毛	2列性，1列为单细胞，另列通常2细胞，长90~220μm。
6. 腺毛	着生于苞片、花冠表面，棒槌状，头部多细胞，多排成2列，围有角质囊，柄多细胞，2列。
7. 花粉粒	类球形，直径22~33μm，外壁有刺，具3个萌发孔。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Non-glandular hairs of bracts	1~8 cells; base of the multicellular ones large, and the apical cell very long.
2. Non-glandular of inner layer bracts	2~3 cells connate.
3. Pappus	Multiseriate non-glandular cells, margin cells slightly convex.
4. Epidermal cells of ovary	Containing columnar crystals of calcium oxalate. Brightly orange or brightly blue in color observed under polarizing microscope.
5. Pollen granules	Subspherical; exine spiny, with 2 germinal pores.

图注

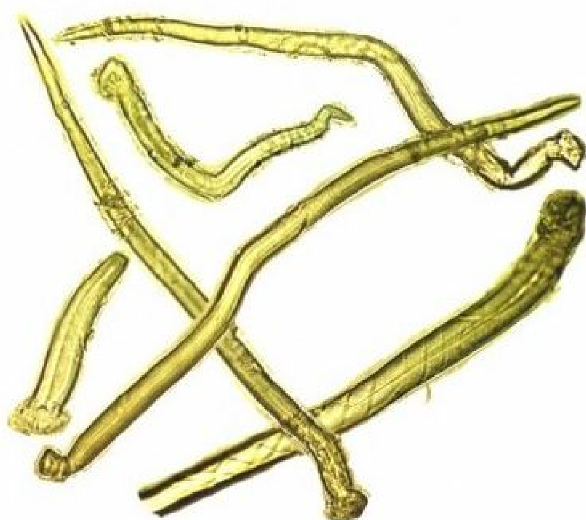
1. 苞片非腺毛	1~8个细胞，多细胞者基部膨大，顶端细胞特长。
2. 内层苞片非腺毛	2~3个细胞并生。
3. 冠毛	为多列性非腺毛，边缘细胞向外突出。
4. 子房表皮细胞	含草酸钙柱晶。偏光显微镜下柱晶呈亮橙黄色或亮蓝色。
5. 花粉粒	类球形，外壁有刺，具2个萌发孔。

玫瑰花 Meiguihua



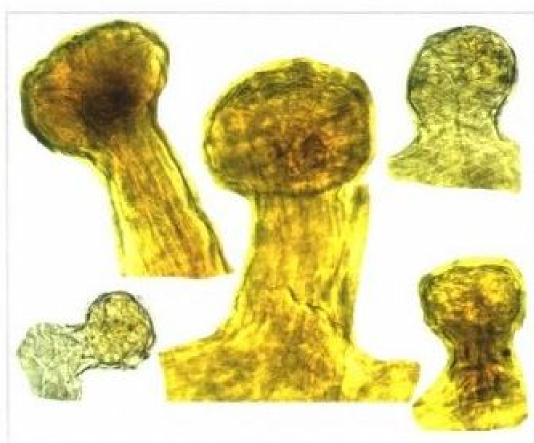
The dried flower bud of *Rosa rugosa* Thunb. (Fam. Rosaceae).
蔷薇科植物玫瑰的干燥花蕾。

1 ***Non-glandular hairs*** 非腺毛



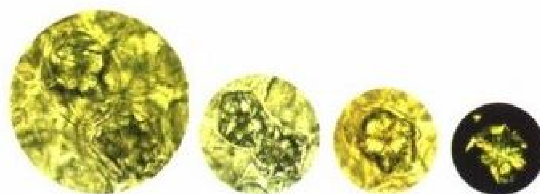
50μm

2 ***Glandular hairs*** 腺毛



50μm

3 ***Clusters of calcium oxalate*** 草酸钙簇晶



50μm

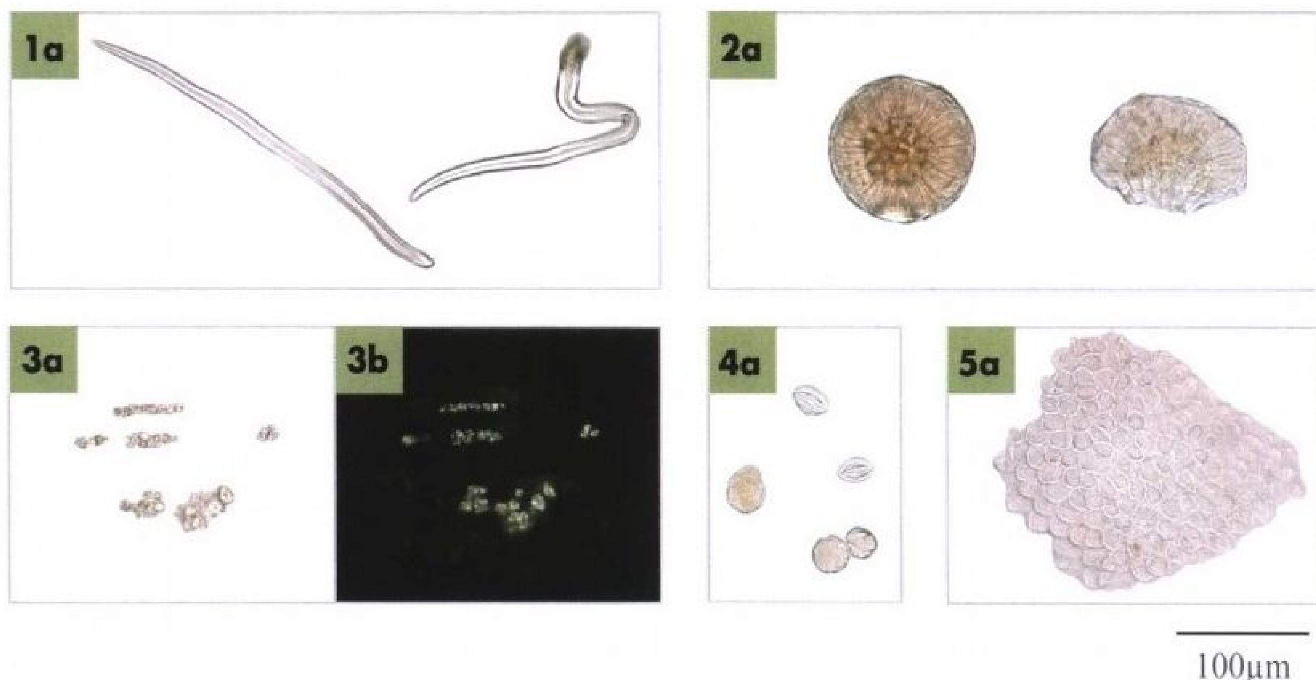
Surface view of sepal

1. Non-glandular hairs	Unicellular; mostly curved; 136~680μm long; with thickened and lignified walls.
2. Glandular hairs	With a multicellular head; oblate; 64~180μm in diameter; stalk multiseriated and 50~340μm in length; sometimes showing unicellular branches at the base.
3. Clusters of calcium oxalate	9~25μm in diameter; showing polychrome under a polarizing microscope.

萼片表面观图注

1. 非腺毛	单细胞，多弯曲，长136 ~ 680μm，壁厚，木化。
2. 腺毛	头部多细胞，扁球形，直径64 ~ 180μm，柄部多列性，长50 ~ 340μm，基部有时可见单细胞分枝。
3. 草酸钙簇晶	直径9 ~ 25μm。在偏光镜下显多彩色。





Notes

1. Non-glandular hairs	Unicellular; mostly curved; 136~680μm long; with thickened and lignified walls.
2. Glandular hairs	Head multicellular and oblate; 64~180μm in diameter; stalk multiseriated and 50~340μm long.
3. Clusters of calcium oxalate	9~25μm in diameter. Brightly orange in color observed under a polarizing microscope.
4. Pollen grains	Triangular in the polar view; ellipsoid in the equatorial view; strip-shaped sculptures on the surface; with 1~3 pore canals.
5. Epidermal cells of petals	Subpolygonal on the surface view; anticlinal walls slightly undulantly curved. In the lateral view, the outer walls of cells bulged and with irregular cuticle striations

图注

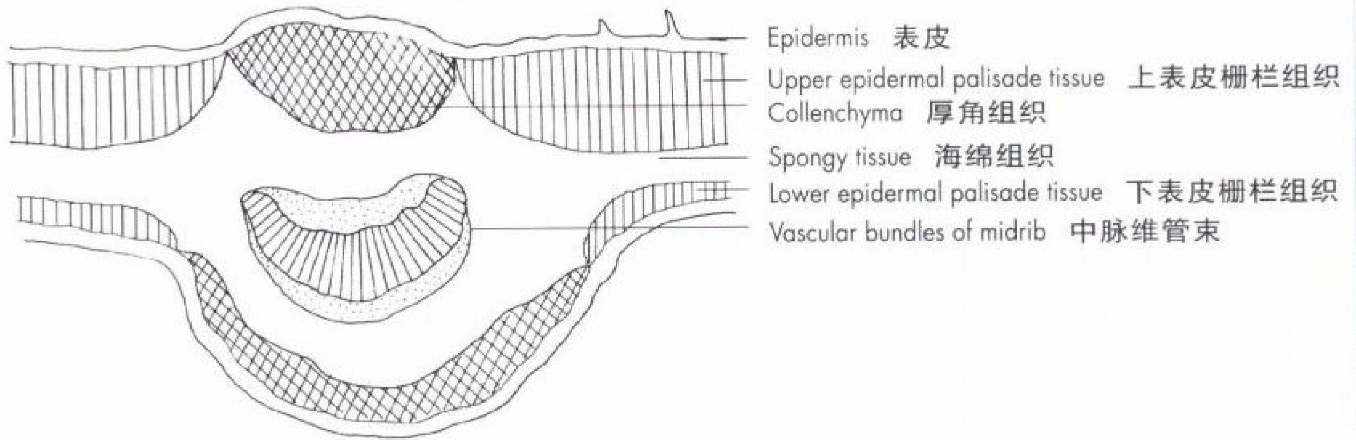
1. 非腺毛	单细胞，多弯曲，长136~680μm，壁厚，木化。
2. 腺毛	头部多细胞，扁球形，直径64~180μm；柄部多列性，长50~340μm。
3. 草酸钙簇晶	直径9~25μm。偏光显微镜下呈亮橙黄色。
4. 花粉粒	极面观呈三角形，赤道面观椭圆形，表面具条状雕纹。具1~3孔沟。
5. 花瓣表皮细胞	表面观呈类多角形，垂周壁细波状弯曲；侧面观细胞外壁隆起，有不规则的角质纹理。



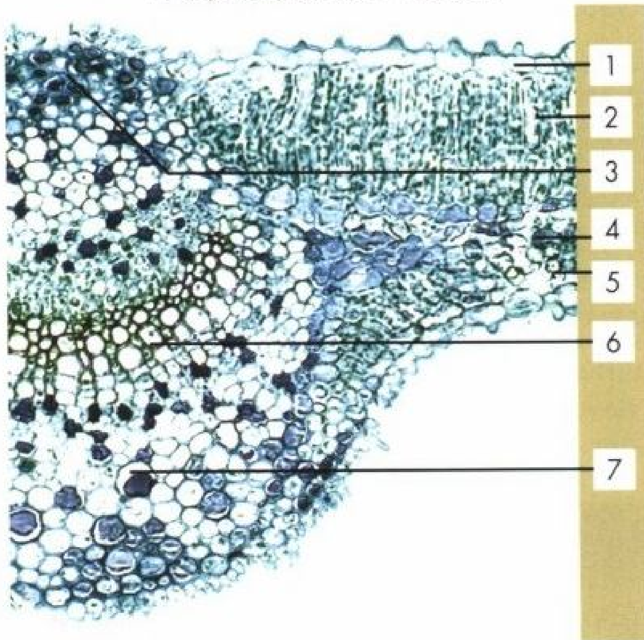
The dried leaf of *Apocynum venetum* L. (Fam. Apocynaceae).

夹竹桃科植物罗布麻的干燥叶。

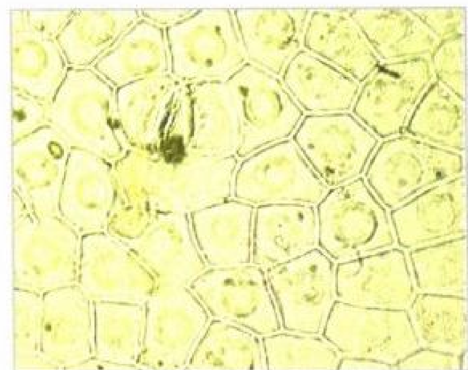
Sketch of transverse section of leaf
叶横切面组织图



Transverse section of leaf (partial)
叶横切面组织图（部分）



A Upper epidermal cells
上表皮细胞



B Lower epidermal cells
下表皮细胞

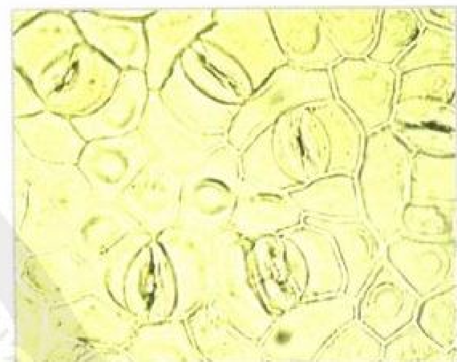


Illustration of surface view of leaf

A. Upper epidermal cells	A: Polygonal; anticlinal walls straight with granular cuticular striations on the surface.
B. Lower epidermal cells	B: Stoma easily observed, paracytic type.

Illustration of transverse section of leaf

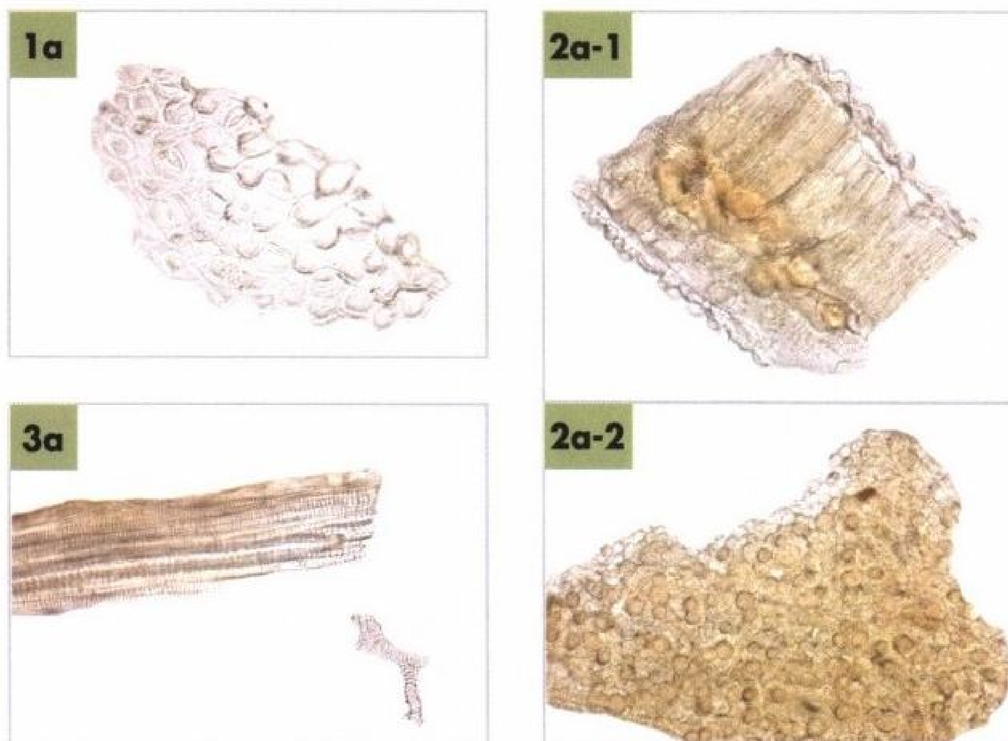
1. Epidermis	Cells flattened; with convex outer walls.
2. Upper epidermal palisade tissue	2 rows of cells.
3. Collenchyma	At the upper and lower sides of midrib.
4. Spongy tissue	Consisting of 2~4 rows of cells in which brown contents occur.
5. Lower epidermal palisade tissue	Mostly 1 row of cells; cells very short.
6. Vascular bundle of midrib	Bicollateral type; laticiferous tubes scattered in phloem and surroundings of fibre bundles.
7. Laticiferous tubes	Scattered in phloem and surroundings of fibre bundles.

叶表面观图注

A. 上表皮细胞	A: 多角形，垂周壁平直，表面有颗粒状角质纹理。
B. 下表皮细胞	B: 气孔多见，平轴式。

叶横切面组织图注

1. 表皮	细胞扁平，外壁凸起。
2. 上表皮栅栏组织	2列细胞。
3. 厚角组织	在中脉上下两侧。
4. 海绵组织	细胞2~4列，含棕色物。
5. 下表皮栅栏组织	多为1列细胞，细胞极短。
6. 中脉维管束	双韧型，维管束周围及韧皮部散有乳汁管。
7. 乳汁管	散在于韧皮部和纤维束周围。



Notes

1. Epidermal cells	Subpolygonal on the surface view; stoma paracytic.
2. Mesophyll tissue	Palisade tissue (2a-1): cells short columnar; spongy tissue (2a-2): cells subspherical, containing brown or reddish-brown content.
3. Vessels	Spiral or annular vessels.

图注

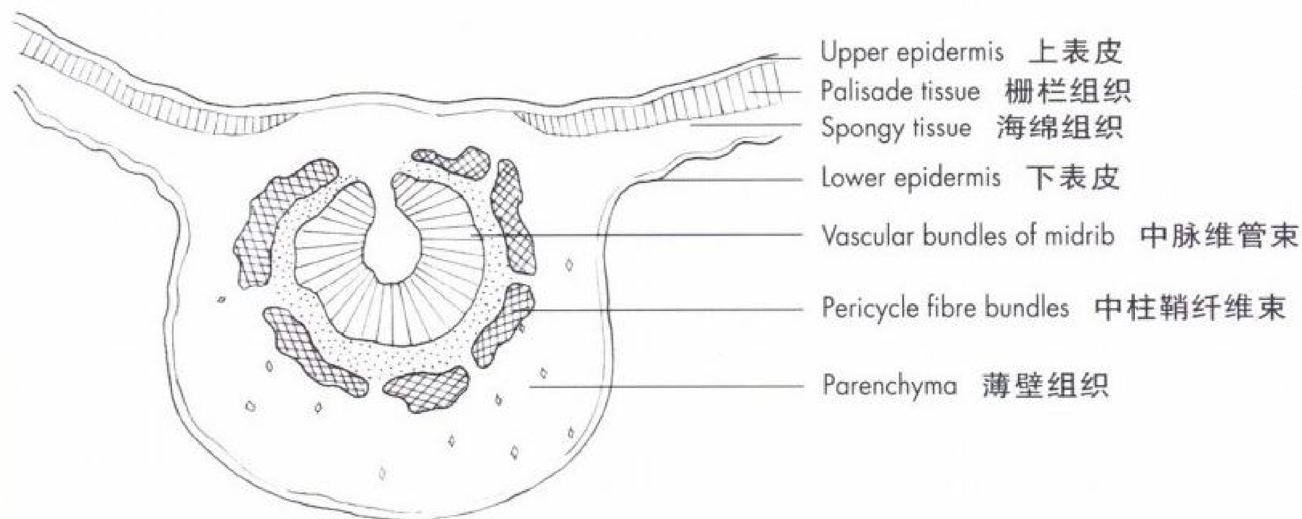
1. 表皮细胞	表面观类多角形，气孔为平轴式。
2. 叶肉细胞	栅栏组织(2a-1)细胞短柱形，海绵组织(2a-2)细胞类球形，内含物棕色或红棕色。
3. 导管	螺纹及环纹导管。



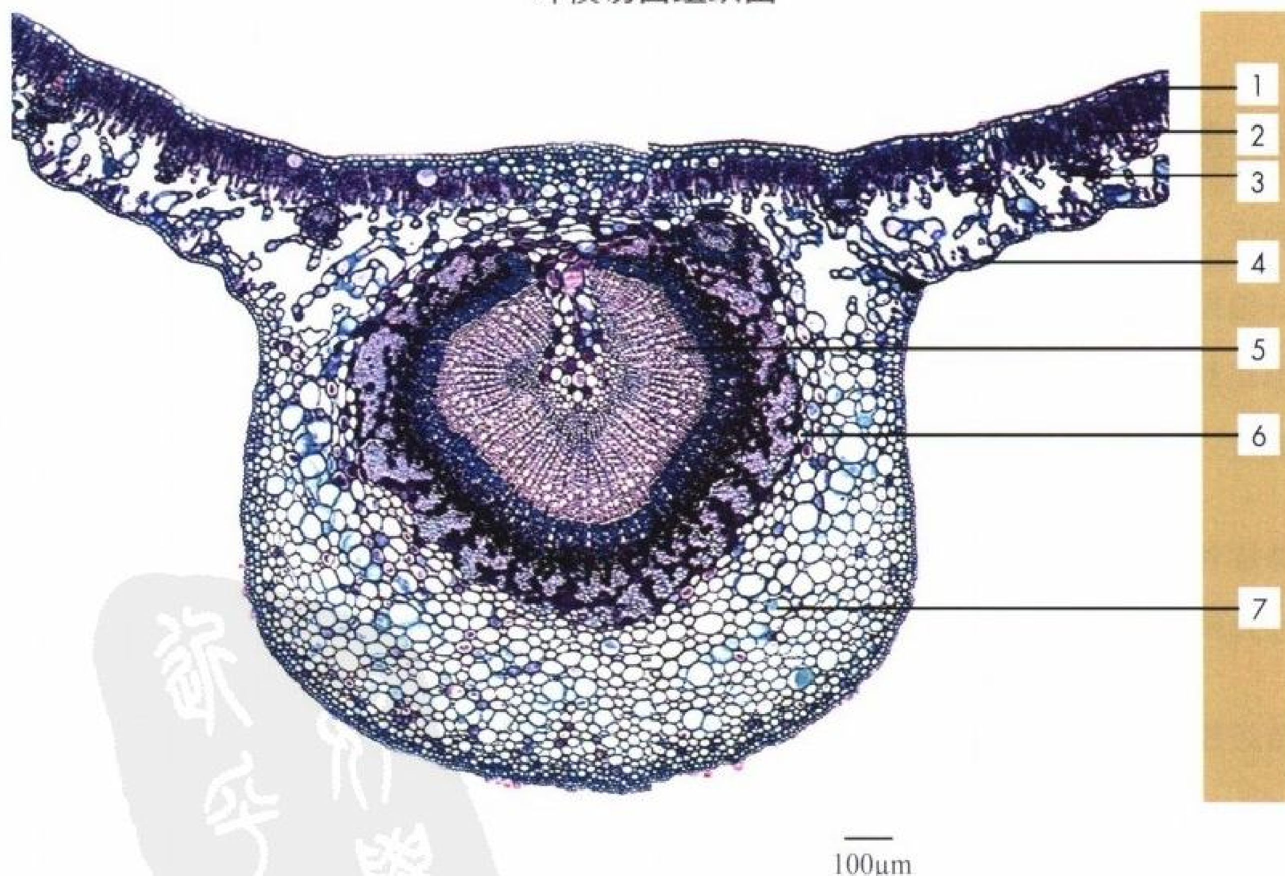
枇杷叶 Pipaye

The dried leaf of *Eriobotrya japonica* (Thunb.) Lindl. (Fam. Rosaceae).
蔷薇科植物枇杷的干燥叶。

Sketch of transverse section of leaf
叶横切面简图



Transverse section of leaf
叶横切面组织图



100μm

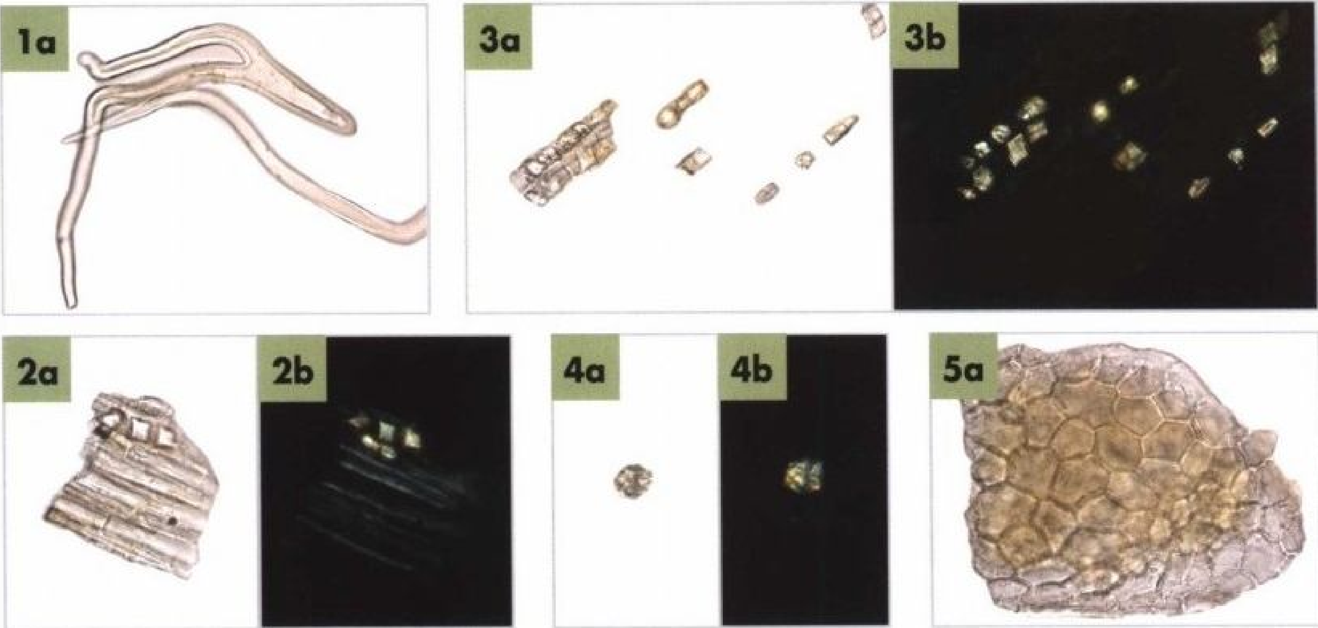
Transverse section of leaf

1. Upper epidermis	Flat square; covered with a thick cuticle.
2. Palisade tissue	Consisting of 3~4 rows of cells.
3. Spongy tissue	Loose; all containing prisms and clusters of calcium oxalate.
4. Lower epidermis	With numerous unicellular non-glandular hairs; usually curved into a V-shape near midrib; stomata visible.
5. Vascular bundle of midrib	Collateral type; nearly ringed.
6. Pericycle fibre bundles	Arranged in an interrupted ring; with lignified walls; surrounded by parenchymatous cells containing prisms of calcium oxalate; forming crystal fibres.
7. Parenchyma	Scattered with mucilage cells and containing prisms of calcium oxalate.

叶横切面组织图注

1. 上表皮	扁方形，外被厚角质层。
2. 栅栏组织	为3~4列细胞。
3. 海绵组织	疏松，均含草酸钙方晶及簇晶。
4. 下表皮	有多数单细胞非腺毛，常弯曲，近中脉处多弯成人字形，气孔可见。
5. 中脉维管束	外韧型，近环状。
6. 中柱鞘纤维束	排列成不连续的环，壁木化，其周围薄壁细胞含草酸钙方晶，形成晶鞘纤维。
7. 薄壁组织	散有黏液细胞，并含草酸钙方晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. **Non-gland hairs**	Large, unicellular and mainly curved; some folded to V-shaped; blunt top and narrow base; slightly lignified.
2. **Fibres and crystal fibres**	Often broken; present in bundles or connected with vessels; fibres slender with the sharp or blunt endings and straight or sinuous margins. Some cells around fibre bundles containing prisms of calcium oxalates to form crystal fibres.
3. **Prisms of calcium oxalates**	Dispersed singly or present in parenchymatous cells. Shapes various, such as short rod-shaped, rhombic, double conical, square, or irregularly polygonal.
4. **Clusters of calcium oxalate**	Present in single or groups in parenchymatous cells; 10~30μm in diameter.
5. **Epidermal cells**	Pale yellow or colorless. Upper epidermal cells: anticlinal walls straight and slightly bead-like thickenings on the surface view. Lower epidermal cells: irregular on the surface view; the anticlinal walls thin and slightly sinuous; anomocytic stomata subcircular or oblong.

图注

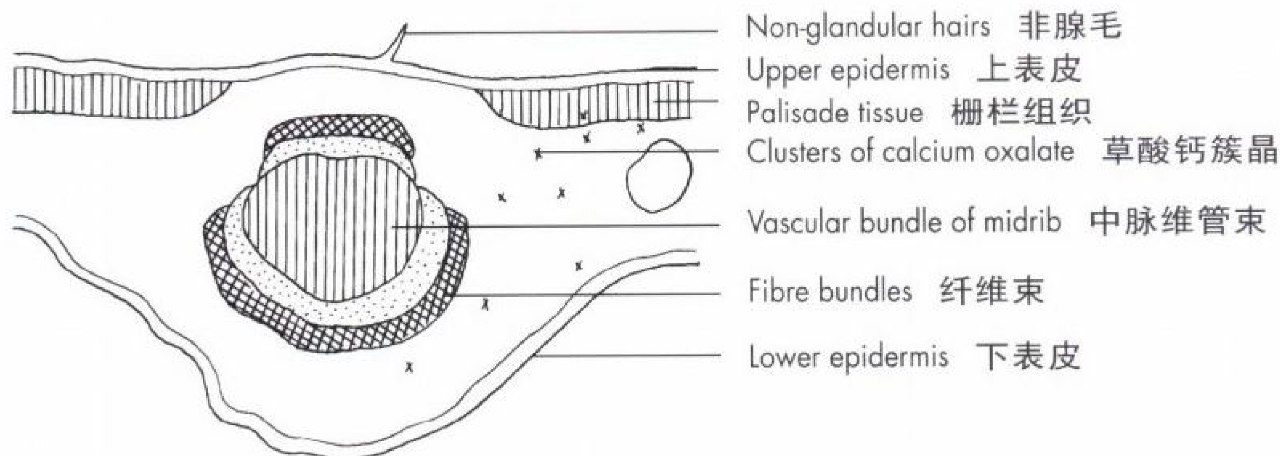
1. 非腺毛	大型，单细胞，多弯曲，有的折合成人字形，顶端钝圆，基部狭窄，微木化。
2. 纤维及晶纤维	多碎断，成束或与导管相连。纤维细长，末端较尖或钝圆，边缘平直或有凸凹。有的纤维束周围细胞中含草酸钙方晶，形成晶纤维。
3. 草酸钙方晶	单个散在或存在于薄壁细胞中。呈短柱形、菱形、双锥形、方形或不规则多面形。
4. 草酸钙簇晶	单个散在或存在于薄壁细胞中，直径10~30μm。
5. 表皮细胞	淡黄色或无色。上表皮细胞：表面观垂周壁较平直，略呈连珠状增厚。下表皮细胞：表面观细胞呈不规则形，垂周壁薄，微弯曲。气孔类圆形或长圆形，不定式。

九里香 Jiulixiang

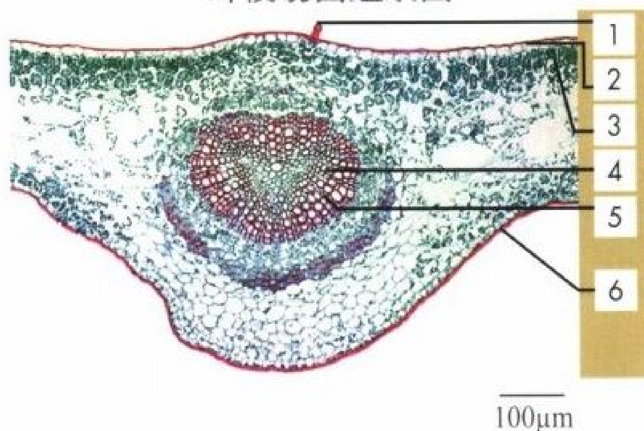


The dried leaf and leaf-bearing young stem of *Murraya exotica* L. (Fam. Rutaceae).
芸香科植物九里香的干燥叶和带叶嫩枝。

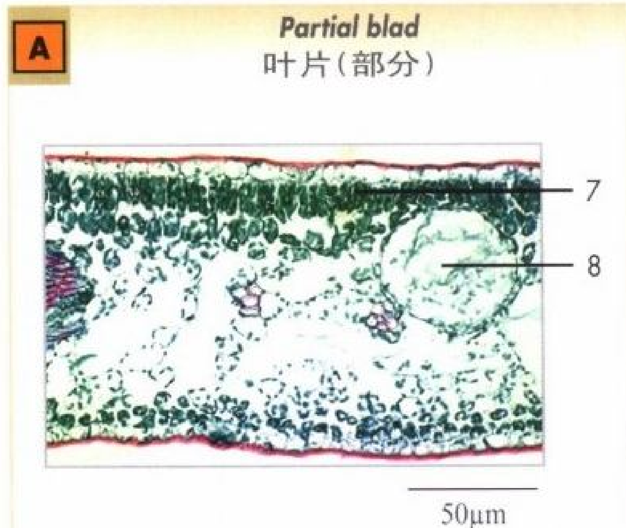
Sketch of transverse section of leaf 叶横切面简图



Transverse section of leaf 叶横切面组织图



A Partial blad 叶片（部分）



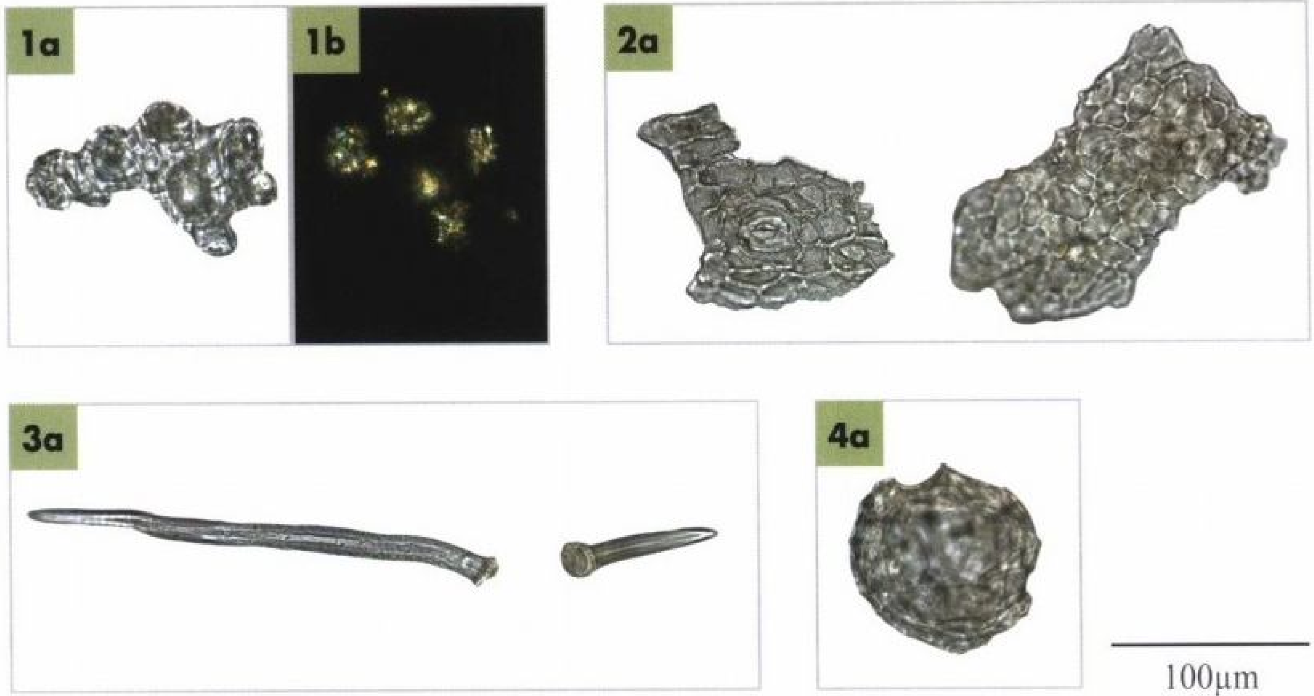
Transverse section of leaf

1. Non-glandular hairs	Unicellular, most of them broken; intact non-glandular hairs 30~100μm long, 9~15μm in diameter.
2. Upper epidermis	1 row, rectangular; showing non-glandular hairs above it.
3. Palisade tissue	2~3 rows of cells.
4. Vascular bundle of midrib	Bicollateral, with lignified fibre groups at the upper and lower sides.
5. Fibres	In groups, lignified.
6. Lower epidermis	1 row, rectangular.
7. Clusters of calcium oxalate	Scattered in mesophyll tissues; 9~25μm in diameter; sometimes showing prisms.
8. Oil cavities	Numerous, rounded; 80~120μm in diameter; containing yellow oil droplets (before dying treatment).

叶横切面组织图注

1. 非腺毛	单细胞，多折断，完整者长30~100μm，直径9~15μm。
2. 上表皮细胞	一列，长方形，其上可见非腺毛。
3. 栅栏组织	2~3列细胞。
4. 中脉维管束	双韧型，其上、下两侧有纤维群，木化。
5. 纤维	成群，木化。
6. 下表皮细胞	一列，长方形。
7. 草酸钙簇晶	散在于叶肉组织中，直径9~25μm，有时可见方晶。
8. 油室	多数，圆形，直径80~120μm，内含黄色油滴(染色处理前)。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Clusters of calcium oxalate	9~25μm in diameter; existing in mesophyll tissues; polychrome under a polarizing microscope.
2. Epidermal cells	Subsquare or polygonal; cell walls slightly undulantly curved or straight; numerous stoma or non-glandular hairs on it.
3. Non-glandular hairs	Unicellular, fusiform, relatively straight; 30~100μm long and 9~15μm in diameter.
4. Oil cavity	Numerous, rounded; 80~120μm in diameter; some containing yellow oil droplets.

图注

1. 草酸钙簇晶	直径9~25μm，存在于叶肉组织中。偏光下多彩状。
2. 表皮细胞	类方形或多角形，细胞壁微波状弯曲或较平直，其上多见气孔或非腺毛。
3. 非腺毛	单细胞，梭形，较平直。长30~100μm，直径9~15μm。
4. 油室	多数，圆形，直径80~120μm，有的内含黄色油滴。

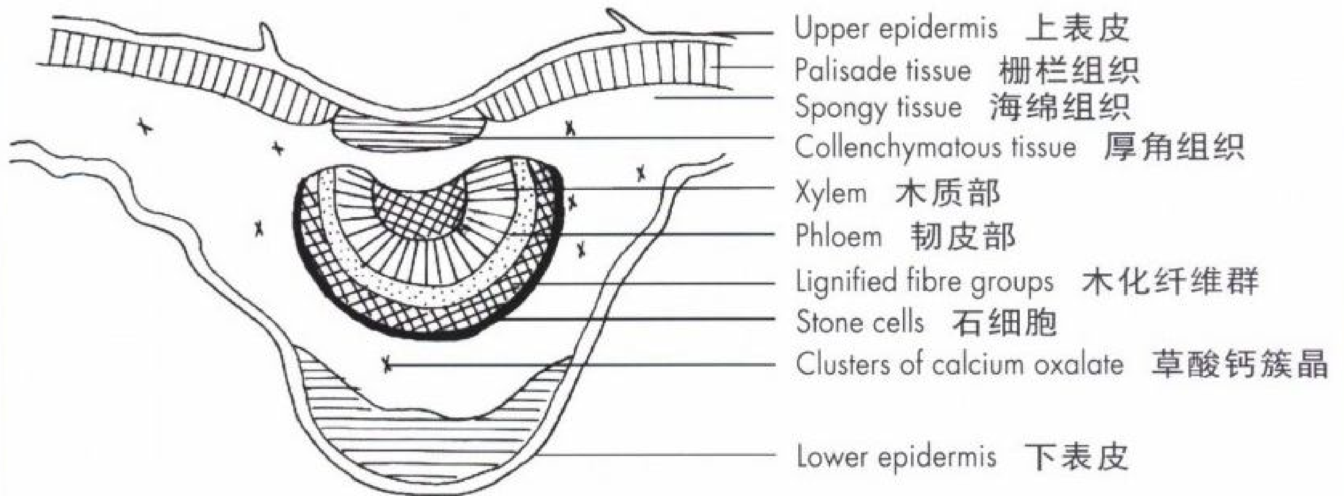
Folium Ilicis Cornutae

枸骨叶 Gouguye

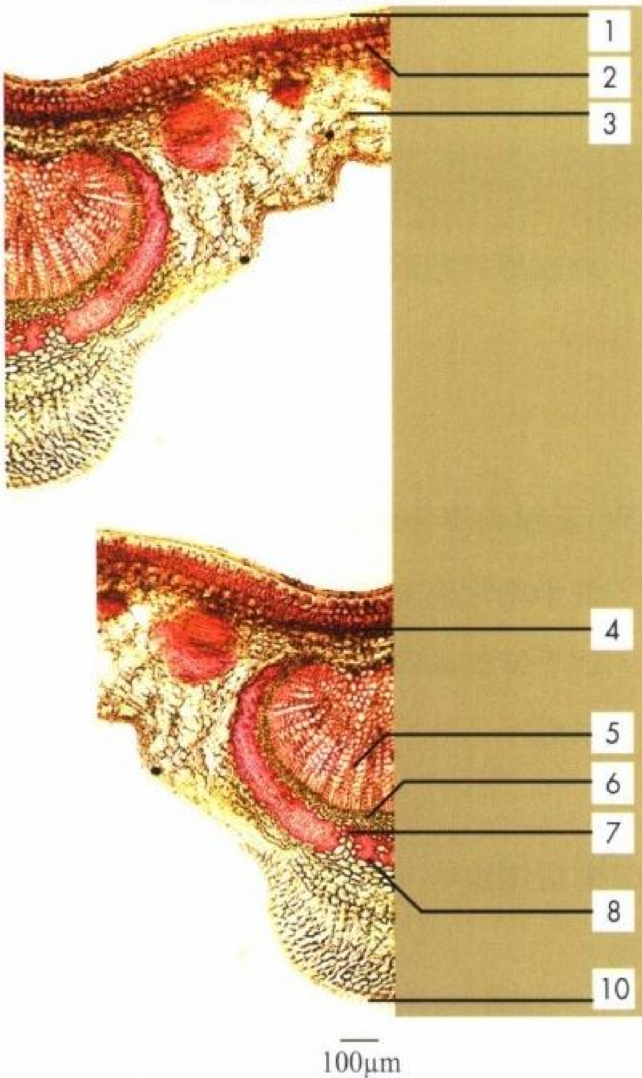


The dried leaf of *Ilex cornuta* Lindl. ex Paxt. (Fam. Aquifoliaceae).
冬青科植物枸骨的干燥叶。

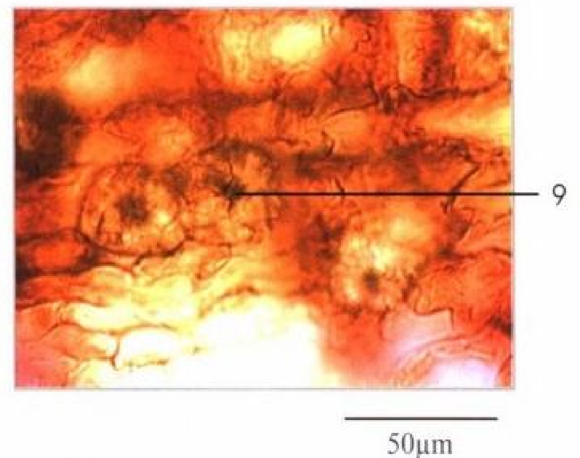
Sketch of transverse section of leaf
叶横切面简图



Transverse section of leaf
叶横切面组织图



A *Clusters of calcium oxalate*
草酸钙簇晶



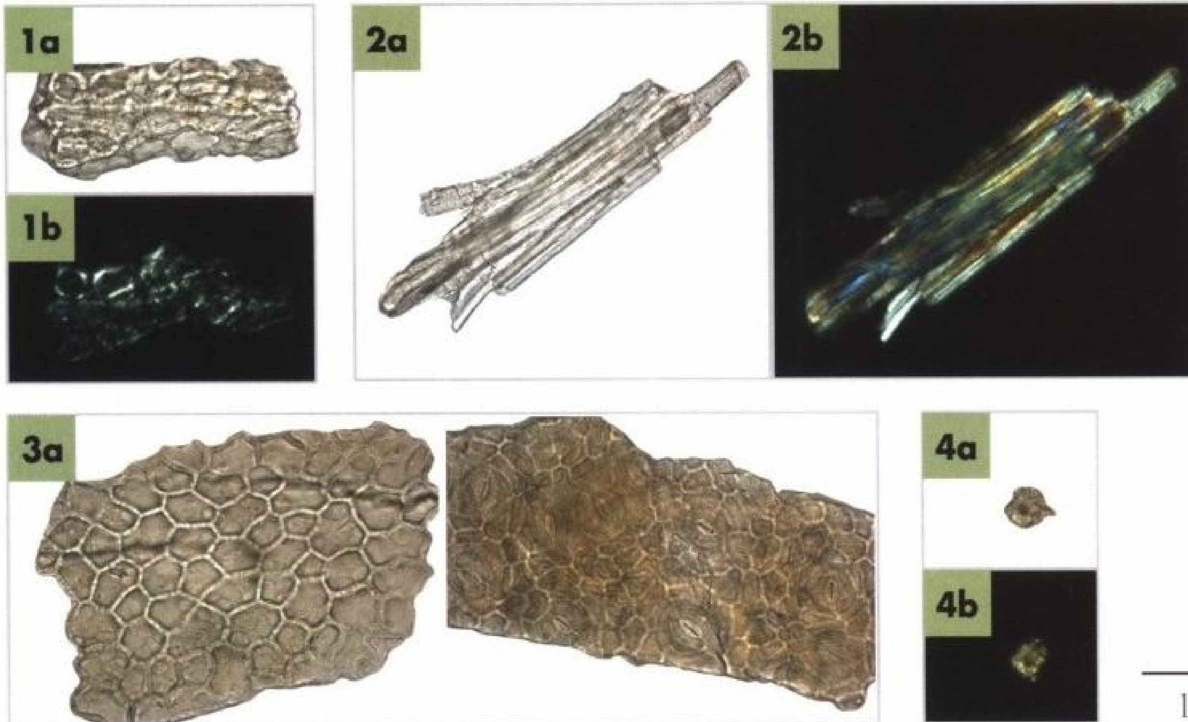
Transverse section of leaf

1. Upper epidermis	Cells subsquare, walls thick, covered with a thick cuticle; with unicellular non-glandular hairs at the midrib.
2. Palisade tissue	Consisting of 2~4 rows of cells.
3. Spongy tissue	Loosely.
4. Collenchyma	Upper and lower epidermis at the midrib consisting of 1 to several rows of collenchymatous cells.
5. Xylem	Vascular bundle of midrib collateral, in the centrial part.
6. Phloem	Vascular bundle of midrib collateral, in the peripheric part.
7. Lignified fibre groups	Above and below the vascular bundle of midrib.
8. Stone cell groups	Semi-ringed.
9. Clusters of calcium oxalate	Occurring in parenchyma and lower epidermal cells.
10. Lower epidermis	Cells slightly small, stomata visible.

叶横切面组织图注

1. 上表皮	细胞类方形，壁厚，外被厚的角质层，主脉处有单细胞非腺毛。
2. 栅栏组织	为2~4列细胞。
3. 海绵组织	疏松。
4. 厚角组织	中脉处上、下表皮为1至数列厚角细胞。
5. 木质部	中脉维管束外韧型，位于维管束中央。
6. 韧皮部	中脉维管束外韧型，位于维管束四周。
7. 木化纤维群	位于中脉维管束上、下方。
8. 石细胞群	半环带。
9. 草酸钙簇晶	存在于薄壁组织及下表皮细胞中。
10. 下表皮	细胞略小，可见气孔。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells	Present in groups or distributed singly; colorless or pale yellow in color; irregularly polygonal, long rectangular-rounded, ovate, subrounded, subsquare or fibrous in shape; walls slightly thin, striations sometime present, pit canals clear.
2. Fibres	Often broken, two or more in bundles or dispersed singly, mostly curved or twisted.
3. Epidermal cells	Upper and lower epidermal cells and leaf margin epidermal cells present in groups. Upper epidermal cells polygonal or irregular on the top view, walls straight or slight wavy, the walls thick, pits canals clear; lower epidermal cells long polygonal or polygonal, smaller than those of upper ones, the walls slightly thin, pits canals unclear; anomocytic stomata dense; leaf margin epidermal cells square, subrectangular or rectangular-polygonal; the walls thick.
4. Clusters of calcium oxalate	Present in spongy tussues and lower epidermal cells; corner angles obtuse.

图注

1. 石细胞	成群或单个散在，无色至淡黄色，呈不规则多角形、长矩圆形、卵圆形、类圆形、类方形或纤维状；壁较薄，有的层纹可见，孔沟明显。
2. 纤维	多碎断，2至数个成束或单个散在，多弯曲或扭曲。
3. 表皮细胞	上、下表皮细胞及叶缘表皮细胞成片。上表皮细胞顶面观呈多角形或不规则多角形，壁较直或略呈波状弯曲，壁厚，孔沟明显；下表皮细胞多呈长多角形或多角形，较上表皮细胞小，壁稍薄，孔沟隐现；气孔较密，不定式；叶缘表皮细胞呈方形、类长方形或长方状多角形，壁较厚。
4. 草酸钙簇晶	存在于海绵组织及下表皮细胞中，棱角钝。

蓼大青叶 Liaodaqingye



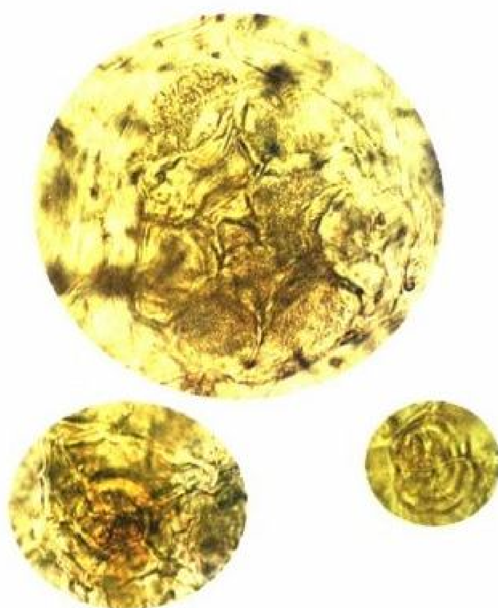
The dried leaf of *Polygonum tinctorium* Ait. (Fam. Polygonaceae)
蓼科植物蓼蓝的干燥叶。

1, 2 ***Epidermal cells and stomata***
表皮和气孔



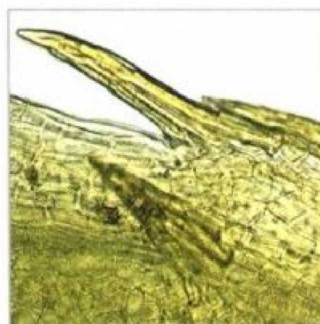
50μm

3 ***Glandular hairs***
腺毛



50μm

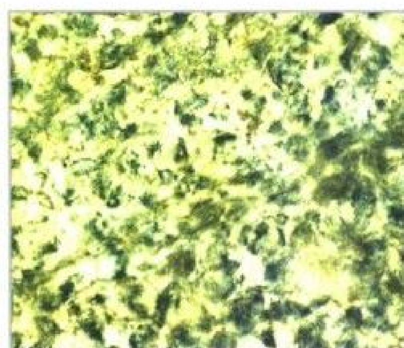
4 ***Non-glandular hairs***
非腺毛





50μm

5 ***Mesophyllous tissues***
叶肉组织



50μm

6 ***Clusters of calcium oxalate***
草酸钙簇晶



50μm

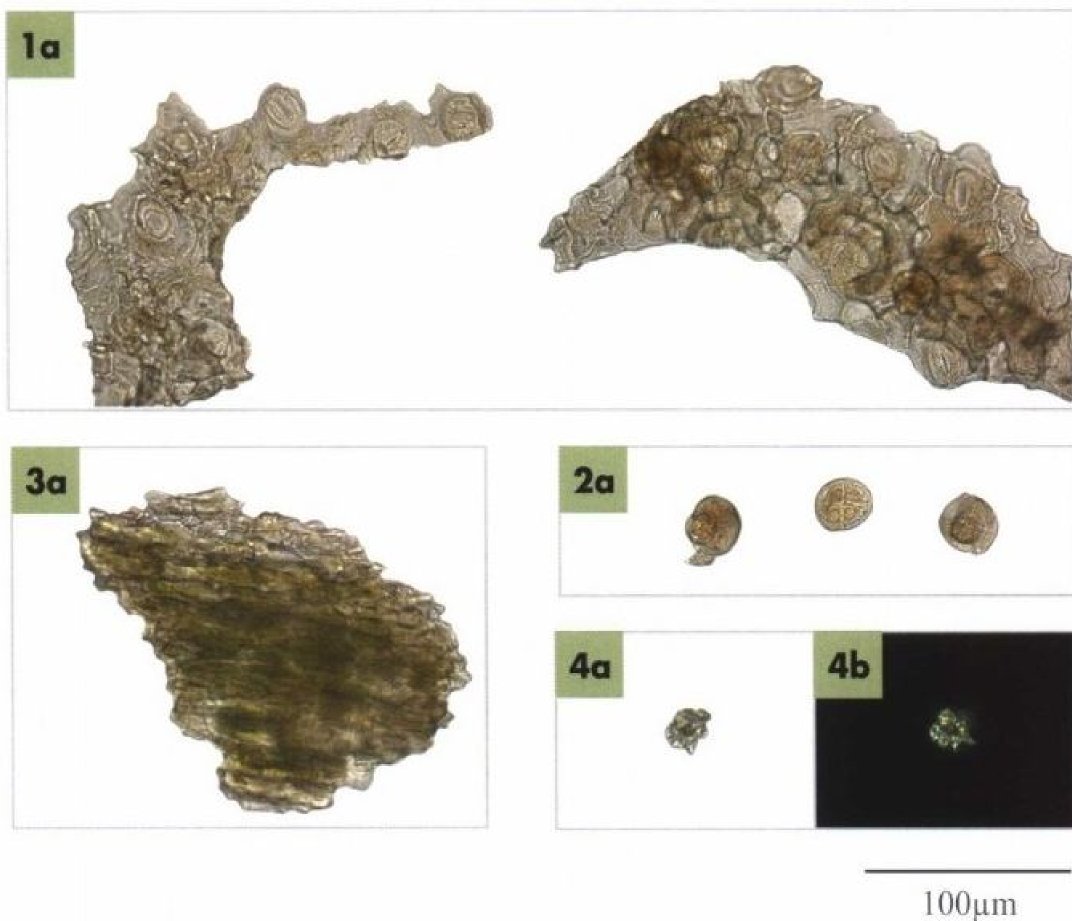
Surface view of leaf

1. Epidermal cells	Polygonal, anticlinal walls straight or slightly sinuous.
2. Stoma	Paracytic type, while few anisocytic type.
3. Glandular hairs	Head 4~8 cells, stalk 2 cells juxtaposition; and also numerous cells forming multiseriate.
4. Non-glandular hairs	Multiseriate, walls lignified and thickened, usually occurring on the edge and midrib.
5. Mesophyllous tissues	Containing numerous blue to bluish-black pigment granules.
6. Clusters of calcium oxalate	Frequently visible, 12~80μm in diameter.

叶的表面观图注

1. 表皮细胞	多角形，垂周壁平直或微波状弯曲。
2. 气孔	平轴式，少数不等式。
3. 腺毛	头部4~8细胞，柄2细胞并列，亦有多细胞构成多列的。
4. 非腺毛	多列性，壁木化增厚，常见于叶片边缘及主脉处。
5. 叶肉组织	含多量蓝色至蓝黑色色素颗粒。
6. 草酸钙簇晶	多见，直径12~80μm。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermis and stoma	Epidermis cells polygonal, anticlinal walls straight or slightly sinuous crooked. Stomata paracytic type, few anisocytic type.
2. Glandular hairs	Head 4~8 cells, stalk 2 cells juxtaposed.
3. Pigment granules	Blue or bluish-black, consisting in mesophyll tissue.
4. Clusters of calcium oxalate	Frequently visible, 12~80μm in diameter. Brightly yellowish-white color observed under a polarizing microscope.

图注

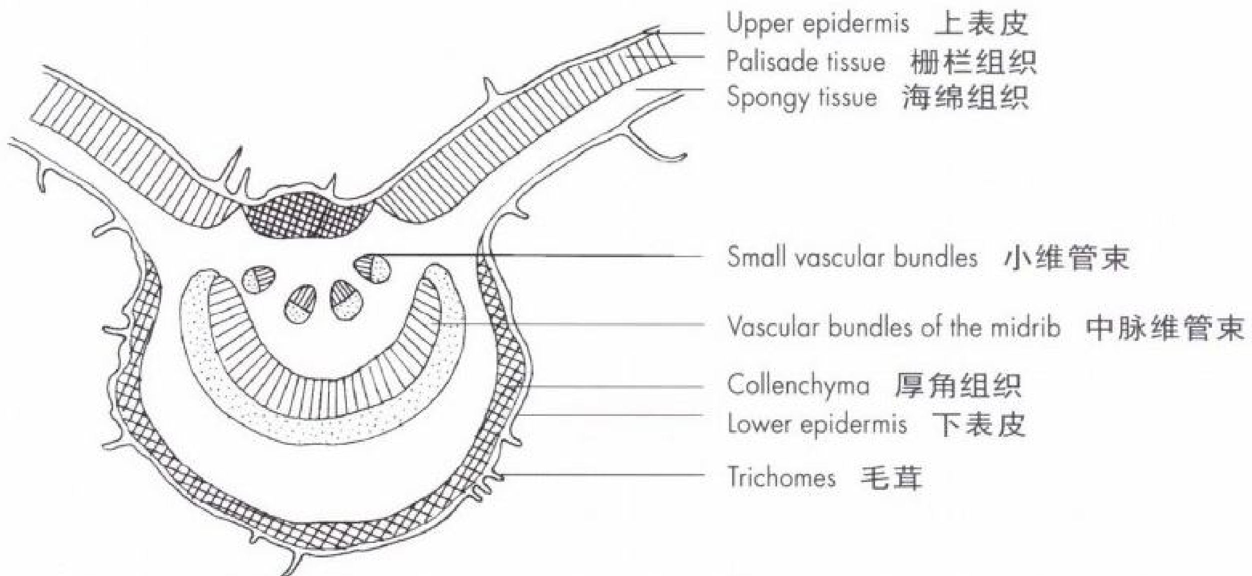
1. 表皮及气孔	表皮细胞多角形，垂周壁平直或微波状弯曲。气孔平轴式，少数不等式。
2. 腺毛	头部4个~8个细胞，柄2个细胞并列。
3. 色素颗粒	呈蓝色或蓝黑色，存在于叶肉组织中。
4. 草酸钙簇晶	多见，直径12~80μm。偏光显微镜下呈亮黄白色。



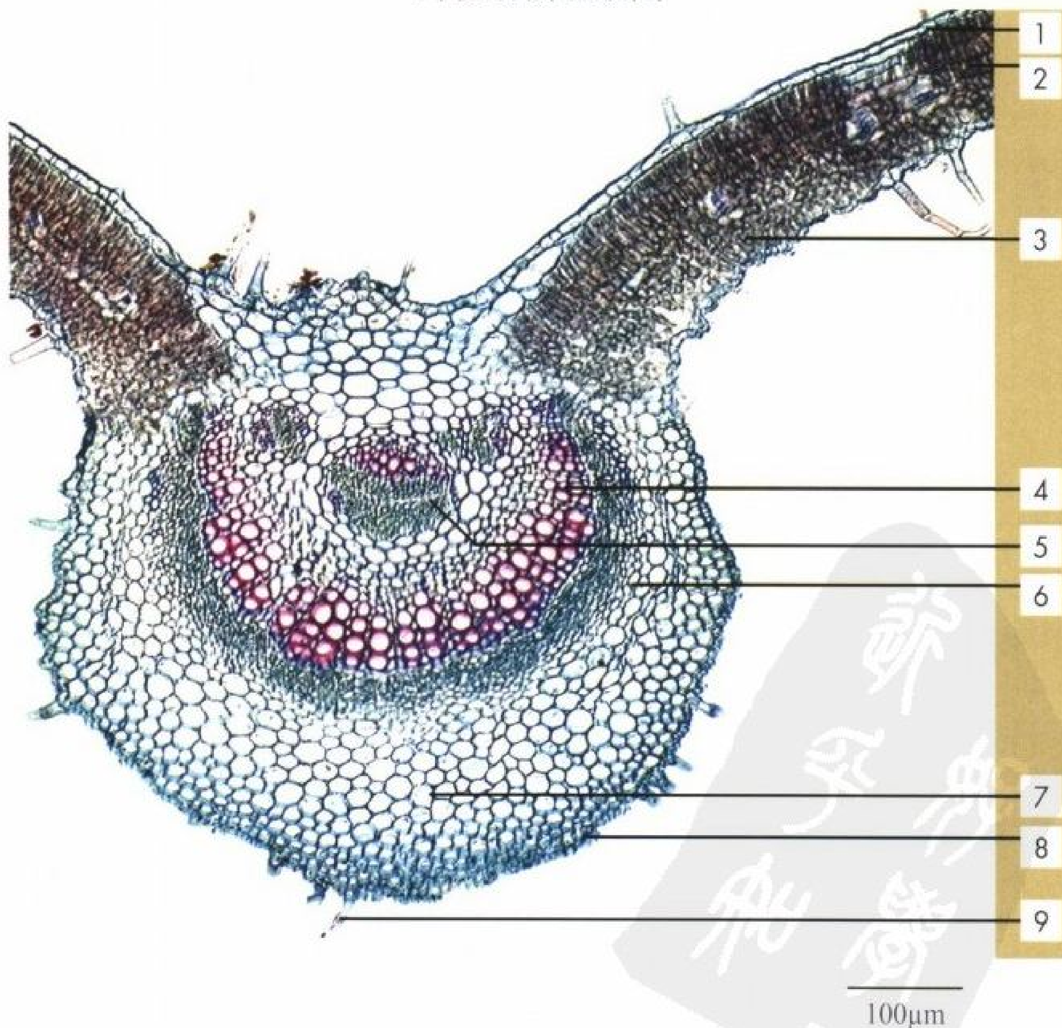
牡荆叶 Mujingye

The fresh leaf of *Vitex negundo* L. var. *cannabifolia* (Sieb. et Zucc.) Hand. – Mazz. (Fam. Verbenaceae).
马鞭草科植物牡荆的新鲜叶。

Sketch of transverse section of leaf
叶横切面简图



Transverse section of leaf
叶横切面组织图



Transverse section of leaf

1. Upper epidermis	Cells arranged regularly; both upper and lower surfaces with trichomes, more trichomes on the lower surface.
2. Palisade tissue of mesophyll	Consisting of 3~4 rows of cells.
3. Spongy tissue	Arranged loosely.
4. Vascular bundles of the midrib	Collateral, crescent or U-shape.
5. Small vascular bundles	1~5, consisting in rabbet of the U-shape.
6. Surrounding parenchymatous cells of vascular bundles	Pits visible.
7. Collenchyma	Consisting in inside of upper and lower epidermis.
8. Lower epidermis	Trichomes relatively more.
9. Trichomes	Non-glandular hairs and glandular hairs.

叶横切面组织图注

1. 上表皮	细胞排列较整齐，上、下表面均有毛茸，下表面毛茸较多。
2. 叶肉栅栏组织	为3~4列细胞。
3. 海绵组织	较疏松。
4. 中脉维管束	外韧型，呈月牙形或"U"字形。
5. 小维管束	位于"U"形的凹部，有1~5个。
6. 维管束周围薄壁细胞	可见纹孔。
7. 厚角组织	位于上、下表皮内方。
8. 下表皮	毛茸较多。
9. 毛茸	非腺毛及腺毛。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermis	Upper epidermal cells subpolygonal or irregular; anticlinal walls undulantly curved; non-glandular hairs; glandular scales and rare small glandular hairs on it. Lower epidermal cells slightly small; anticlinal walls curved or relatively straight; with numerous stoma and non-glandular hairs; glandular scales and small glandular hairs relatively abundant.
2. Non-glandular hairs	1~4 cells, apical cells relatively long; with verrucae on the surface.
3. Glandular scales	4 cells on the head, about 55μm in diameter; unicellular stalk.
4. Small glandular hairs	1~4 cells on the head, about 25μm in diameter; stalk 1~3 cells and very short.

图注

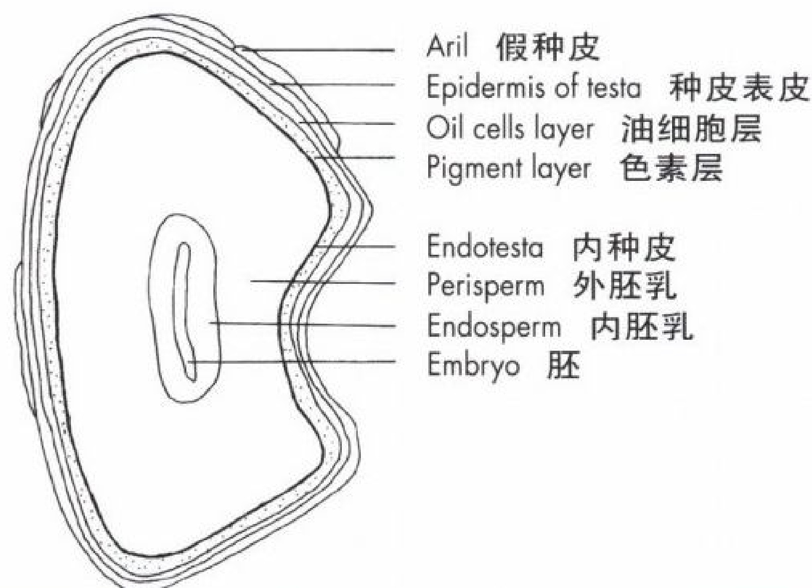
1. 表皮	上表皮细胞呈类多角形或不规则形，垂周壁波状弯曲；其上有非腺毛、腺鳞，小腺毛较少。下表皮细胞略小，垂周壁弯曲或较平直，有多数气孔及非腺毛，腺鳞及小腺毛较多。
2. 非腺毛	1~4细胞，先端细胞较长，表面有疣状突起。
3. 腺鳞	头部4个细胞，直径约至55μm，柄单细胞。
4. 小腺毛	头部1~4细胞，直径约至25μm，柄1~3细胞，甚短。

益智 Yizhi

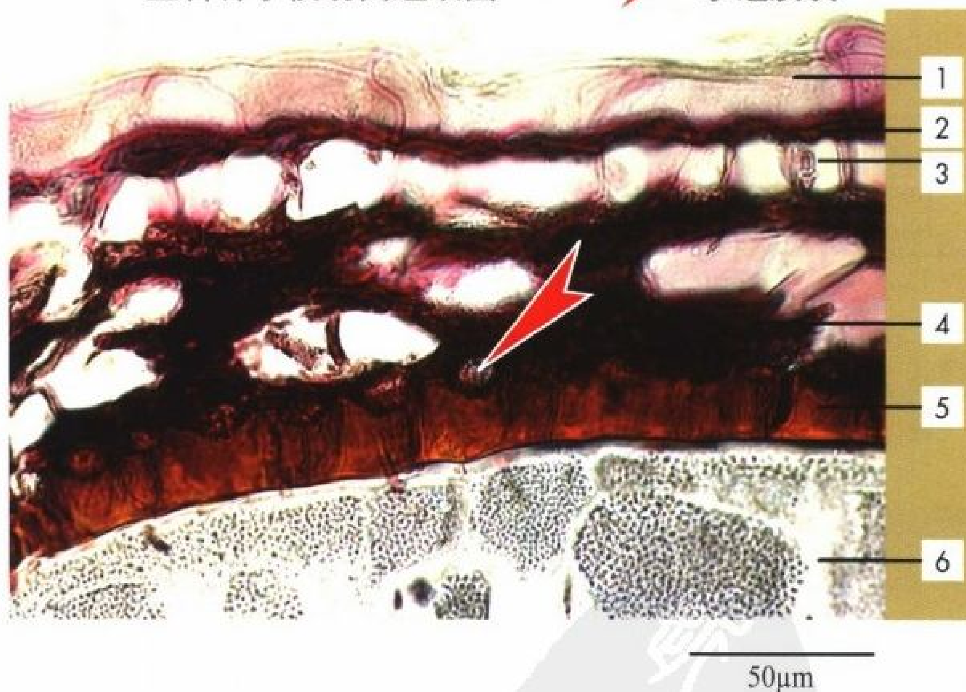


The dried ripe fruit of *Alpinia oxyphylla* Miq. (Fam. Zingiberaceae).
姜科植物益智的干燥成熟果实。

Sketch of transverse section of seed
种子横切面组织简图



Transverse section of seed — "⚡" showing silica mass
益智种子横切面组织图 — "⚡" 示硅质块



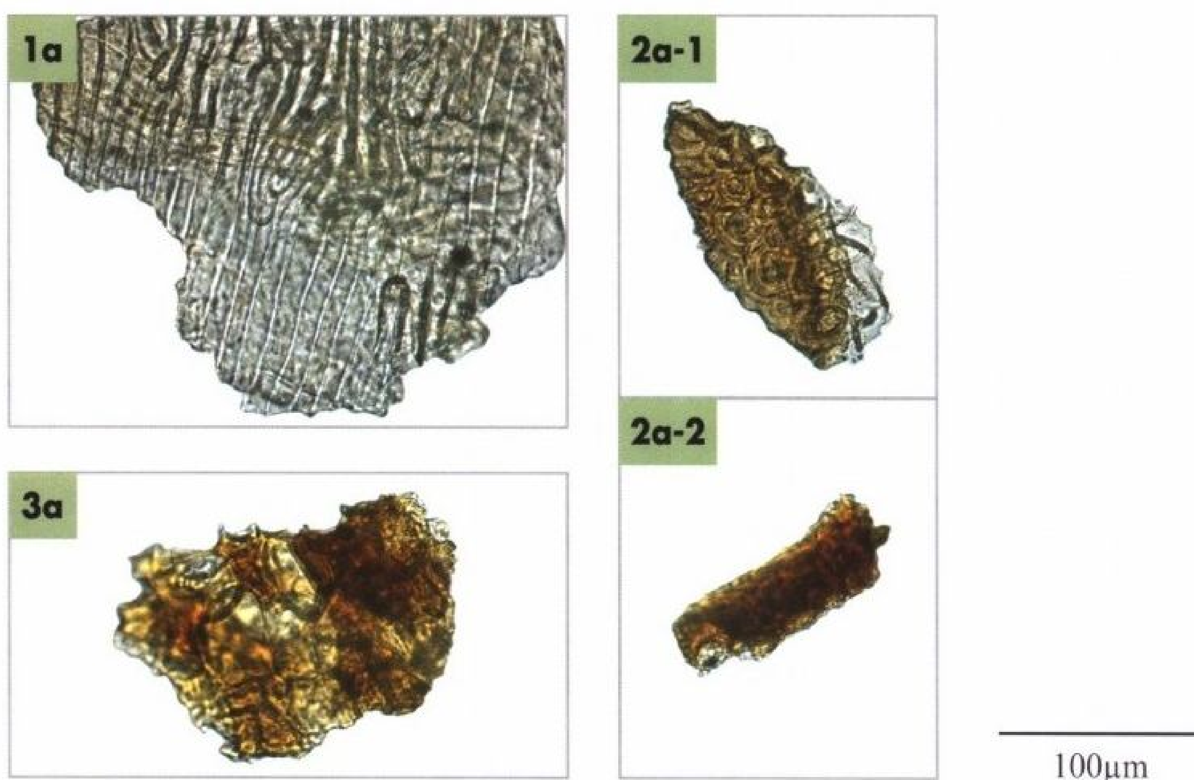
Transverse section of seed

1. Epidermal cells of testa	Subrounded, subsquare or rectangular; slightly radially elongated; relatively thick-walled.
2. Hypodermis	Consisting of 1 row of parenchymatous cells; containing yellowish-brown contents.
3. Oil cells layer	1 row of cells; subsquare or rectangular; containing yellowish oil droplets.
4. Pigment layer	Consisting of several rows of yellowish –brown cells; scattered with 1~3 rows of relatively large subrounded oil cells; containing yellow oil droplets.
5. Endotesta	Consisting of palisade cells; yellowish-brown or reddish-brown; the inner and lateral walls terribly thick; with small lumina containing silica masses.
6. Perisperm	Filled with starch masses aggregated by fine starch granules in cells.

种子横切面组织图注

1. 种皮表皮细胞	类圆形、类方形或长方形，略径向延长，壁较厚。
2. 下皮	为1列薄壁细胞，含黄棕色物。
3. 油细胞层	1列细胞，类方形或长方形，含黄色油滴。
4. 色素层	为数列黄棕色细胞，其间散有较大的类圆形油细胞1～3列，含黄色油滴。
5. 内种皮	为1列栅状细胞，黄棕色或红棕色，内壁与侧壁极厚，胞腔小，内含硅质块。
6. 外胚乳	细胞中充满细小淀粉粒集结成的淀粉团。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermal cells of testa	Rectangular on the surface view; with slightly thickened walls; usually vertical to hypodermis.
2. Sclerenchymatous cells of endotesta	On the surface view (2a-1): polygonal, yellowish-brown; with thick walls; non-lignified; lumina containing silica masses. In the lateral view (2a-2): showing 1 row of palisade-like cells; the inner and lateral walls extremely thickened; lumina nearby outsides.
3. Pigment layer cells	Shrinked; complete cells polygonal, yellowish-brown; scattered with relatively big subrounded oil cell. Oil cells mostly broken; colorless or pale yellow; connected with pigment cells.

图注

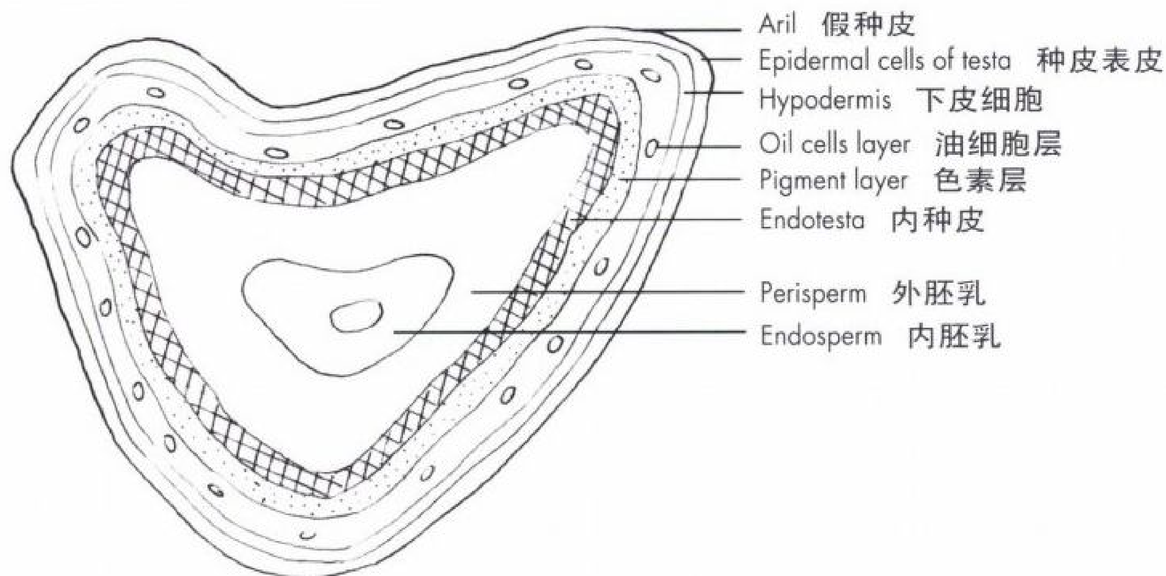
1. 种皮表皮细胞	表面观呈长方形，壁稍厚，常与下皮细胞上下层垂直排列。
2. 内种皮厚壁细胞	表面观(2a-1)：多角形，黄棕色壁厚，非木化，胞腔内含硅质块。侧面观(2a-2)：细胞一列，栅状，内壁及侧壁极厚，胞腔偏外侧。
3. 色素层细胞	皱缩，完整细胞呈多角形，黄棕色，其间散有较大的类圆形油细胞。油细胞多不完整，无色或淡黄色，与色素层细胞连结。



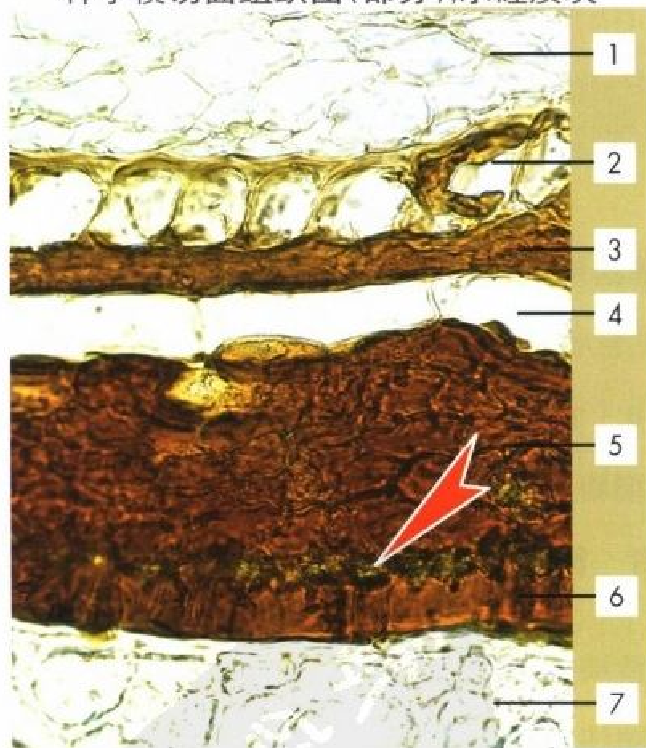
砂仁 Sharen

The dried ripe fruit of *Amomum villosum* Lour. (Fam. Zingiberaceae).
姜科植物阳春砂的干燥成熟果实。

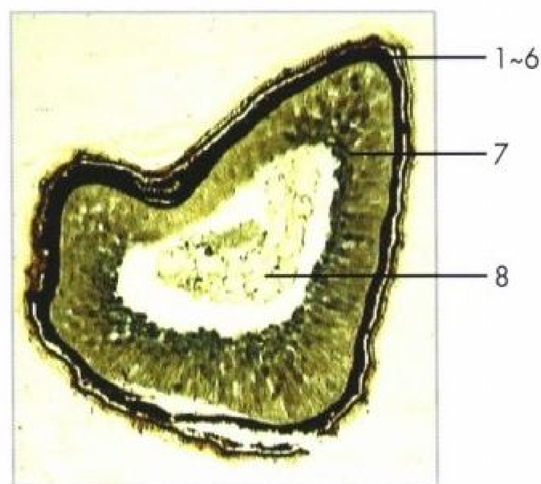
Sketch of transverse section of seed
种子横切面简图



Transverse section of seed (partial)
" " showing silica mass
种子横切面组织图(部分),示硅质块



Transverse section of seed
种子横切面组织图



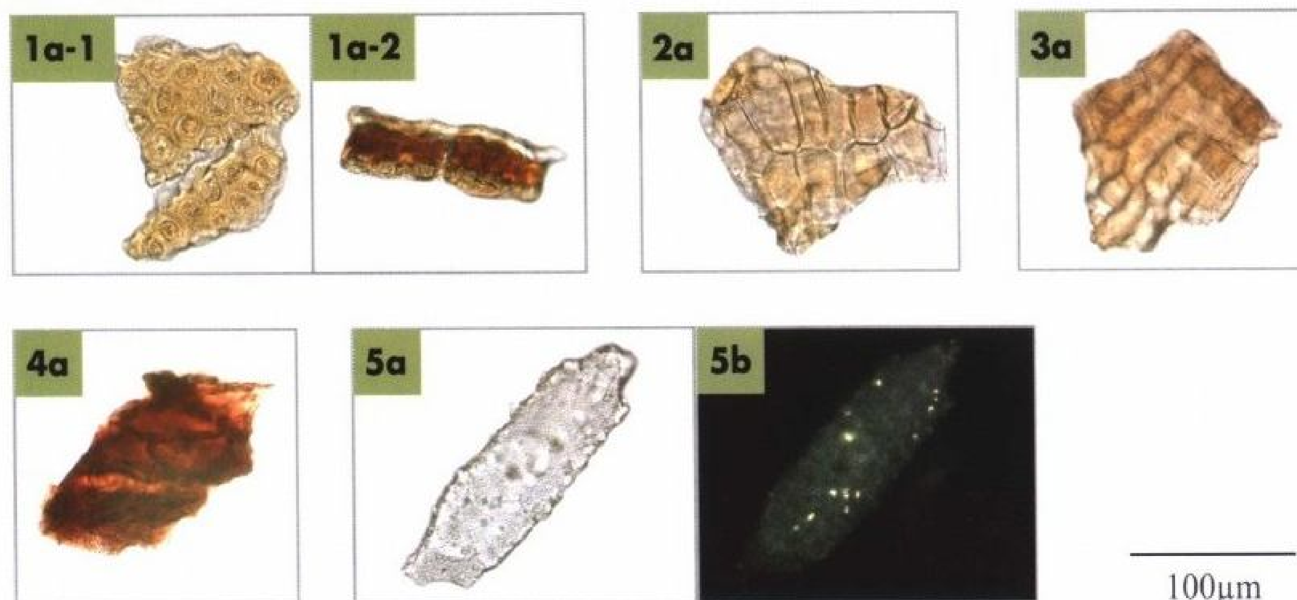
Transverse section of seed

1. Aril	Sometimes remains.
2. Epidermal cells of testa	1 row, elongated radially; with slightly thick walls.
3. Hypodermis	1 row of cells; containing brown or reddish-brown contents.
4. Oil cells layer	Consisting of 1 row of oil cells; 76~106μm long and 16~25μm wide; containing yellow oil droplets.
5. Pigment layer	Consisting of several rows of brown cells; polygonal and irregularly arranged.
6. Endotesta	Consisting of 1 row of palisade sclerenchymatous cells; yellowish-brown; with extremely thickened inner and lateral walls; cells small and containing silica mass.
7. Perisperm	Containing starch granules in cells; and with few fine prisms of calcium oxalate.
8. Endosperm	Containing fine aleurone granules and fatty oil droplets in cells.

种子横切面组织图注

1. 假种皮	有时残存。
2. 种皮表皮细胞	1列，径向延长，壁稍厚。
3. 下皮细胞	1列，含棕色或红棕色物。
4. 油细胞层	为1列油细胞，长76 ~ 106μm，宽16 ~ 25μm，含黄色油滴。
5. 色素层	为数列棕色细胞，细胞多角形，排列不规则。
6. 内种皮	为1列栅状厚壁细胞，黄棕色，内壁及侧壁极厚，细胞小，内含硅质块。
7. 外胚乳	含淀粉粒，并有少数细小草酸钙方晶。
8. 内胚乳	含细小糊粉粒及脂肪油滴。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Sclerenchymatous cells of endotesta	Yellowish-brown or brown; polygonal on the surface view (1a-1): with walls thickened and non-lignified; containing silica masses. In the section view(1a-2): 1 row of palisade cells; with inner walls and lateral walls rather thickened; lumina inclined to the outer side and containing silica masses.
2. Epidermal cells of testa	Pale yellow; strip-shaped on the surface view; usually vertically arranged with hypodermal cells in an upper and lower layered pattern.
3. Hypodermal cells	Containing brown or reddish-brown masses.
4. Pigments layer cells	Shrivelled with indistinct border; containing reddish-brown or dark brown masses.
5. Perisperm cells	Subrectangular or irregularly shaped; filled with starch masses aggregated by small starch granules and containing fine prisms of calcium oxalate.

图注

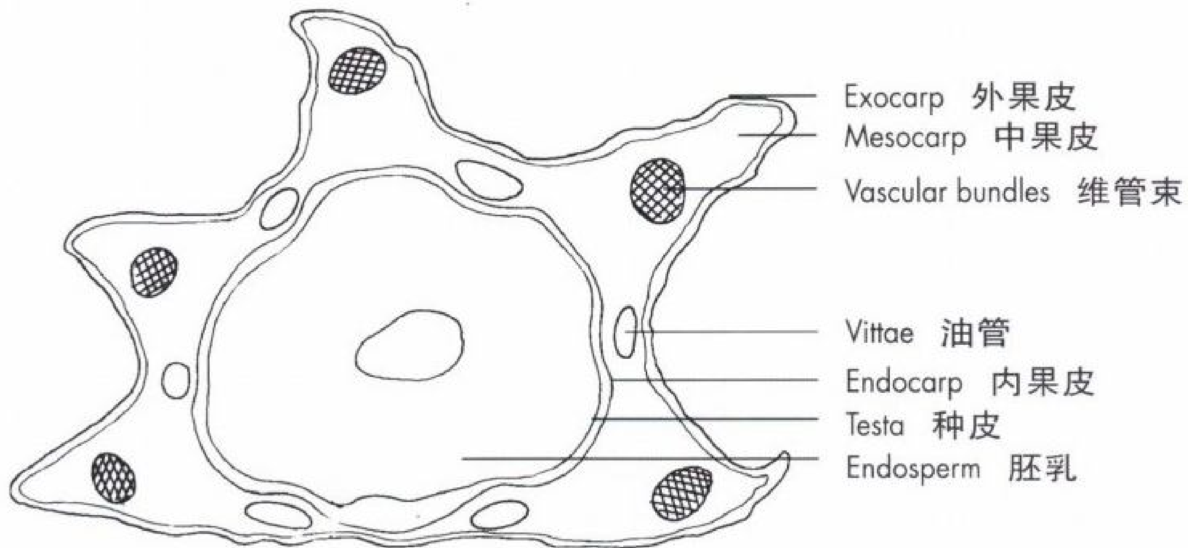
1. 内种皮厚壁细胞	黄棕色或棕色，表面观(1a-1)：呈多角形，壁厚，非木化，内含硅质块；断面观(1a-2)：为1列栅状细胞，内壁及侧壁极厚，胞腔偏外侧，内含硅质块。
2. 种皮表皮细胞	淡黄色，表面观长条形，常与下皮细胞上下层垂直排列。
3. 下皮细胞	含棕色或红棕色物。
4. 色素层细胞	皱缩，界限不清楚，含红棕色或深棕色物。
5. 外胚乳细胞	类长方形或不规则形，充满由小淀粉粒集结成的淀粉团，并含有细小的草酸钙方晶。



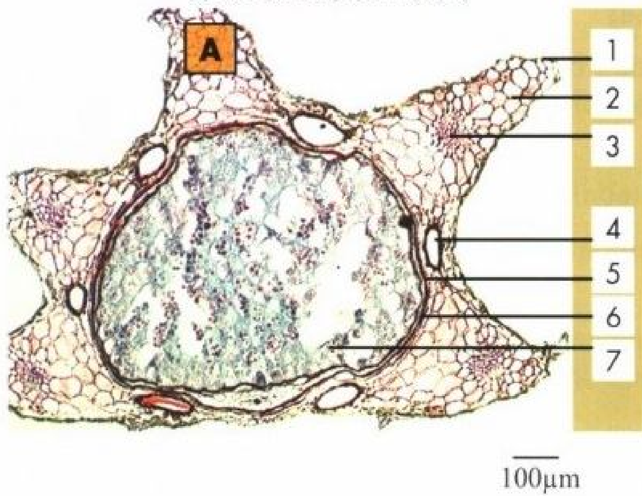
蛇床子 Shechuangzi

The dried ripe fruit of *Cnidium monnieri* (L.) Cuss. (Fam. Umbelliferae).
伞形科植物蛇床的干燥成熟果实。

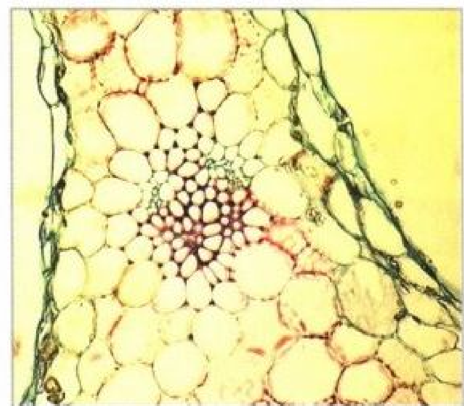
Sketch of transverse section of fruit
果实横切面简图



Transverse section of fruit
果实横切面组织图



A Vascular bundle
维管束



Transverse section of fruit

1. Exocarp	Consisting of 1 row of flat cells, covered with cuticles.
2. Mesocarp	Relatively thick, longitudinal ridges extremely raised, with vascular bundles in the middle. Commissural surface showing 2 elliptical vitta, but 6 vitta present in total.
3. Vascular Bundles	Surrounded by sclerenchymatous and lignified reticulate cells.
4. Vittae	Comparatively large.
5. Endocarp	Consisting of 1 row of flat cells.
6. Testa	Consisting of 1 row of pale brown cells.
7. Endosperm	Cells containing numerous aleurone granules, each granules containing fine clusters of calcium oxalate.

果实横切面组织图注

1. 外果皮	为1列扁平细胞，外被角质层。
2. 中果皮	较厚，纵棱异常突出，中部有维管束。背面纵棱间有椭圆形油管1个，接合面有油管2个，共有油管6个。
3. 维管束	周围有厚壁木化网纹细胞。
4. 油管	较大。
5. 内果皮	为1列扁平细胞。
6. 种皮	为1列淡棕色细胞。
7. 胚乳	细胞含多数糊粉粒，每个糊粉粒中含有细小草酸钙簇晶。

Main Powder Characteristics
主要粉末显微特征



Notes	
1. Reticulate cells	Subsquare or subrounded; walls slightly thickened, non-lignified or slightly lignified, with strip-shaped or reticulate thickenings.
2. Fragments of vittae	Yellowish-brown or dark reddish-brown, some with septa; cellular trace indistinct on the surface.
3. Inlaid (endocarp) cells	Cell walls bead-like thickened.

图注	
1. 网纹细胞	类方形或类圆形，壁稍厚，非木化或微木化，具条状或网状增厚。
2. 油管碎片	黄棕色或深红棕色，有的可见横隔，表面隐约可见细胞痕迹。
3. 镶嵌(内果皮)细胞	细胞壁呈念珠状增厚。

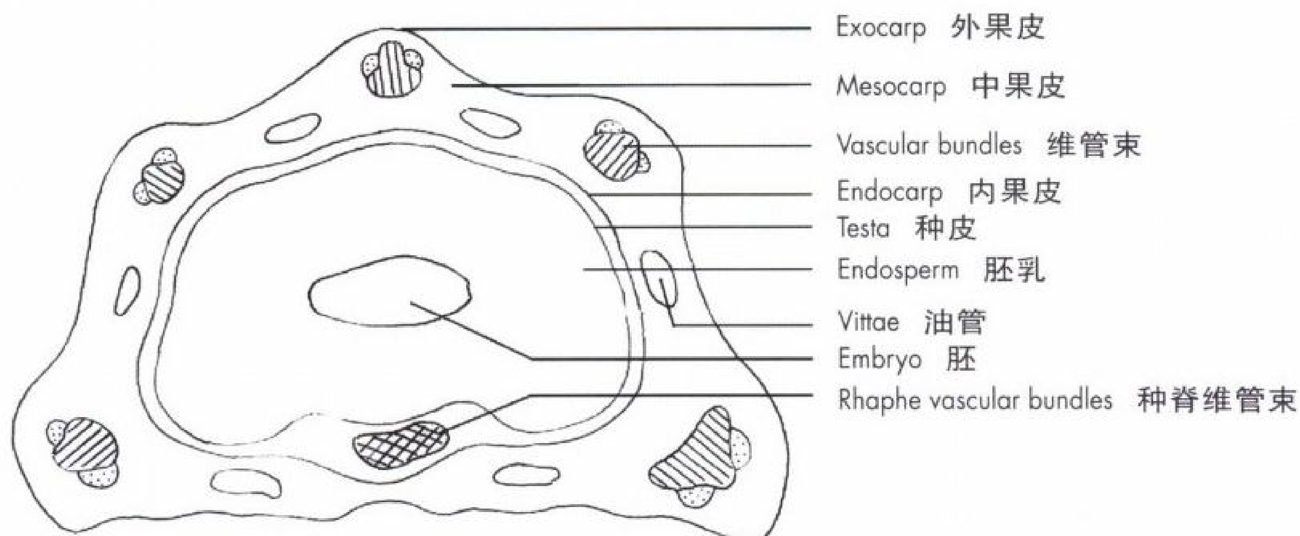


小茴香 Xiaohuixiang

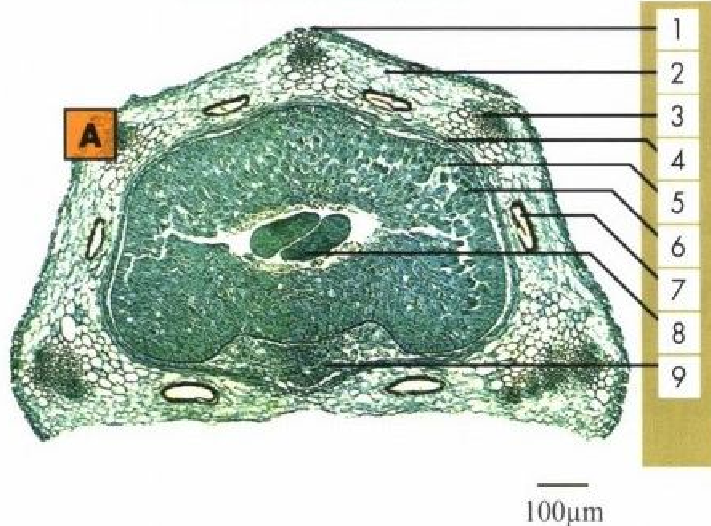
The dried ripe fruit of *Foeniculum vulgare* Mill. (Fam. Apiaceae).

伞形科植物茴香的干燥成熟果实。

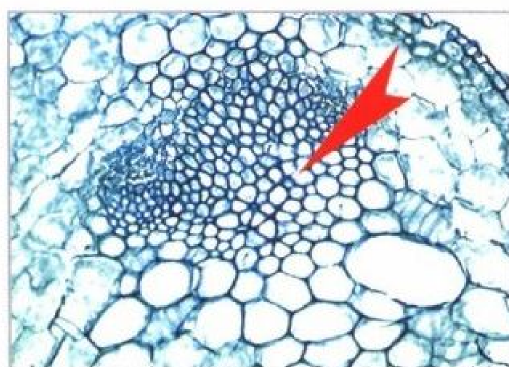
Sketch of transverse section of fruit 果实横切面简图



Transverse section of fruit 果实横切面组织图



A Vascular bundle 维管束





Transverse section of fruit

1. Exocarp	Consisting of 1 layer of flat cells; covered with cuticles.
2. Mesocarp	Vascular bundles in the middle of ribs; 1 large elliptical vittae between every two dorsal ribs; 2 vittae at the commissural surface and six vittae in total.
3. Vascular bundles	Phloem existing in upper part of xylem's double side; vascular bundles surrounded by lignified reticulate cells.
4. Endocarp	Consisting of 1 layer of flat and parenchymatous cells.
5. Testa	The testa cells compressed and elongated; containing brown contents.
6. Endosperm	Cells containing aleurone granules and fine clusters of calcium oxalate.
7. Vittae	Consisting of dozens of reddish-brown flat and small secretory cells.
8. Embryo	Small, present in the center of the endosperm.
9. Rhaphe vascular bundles	Consisting of several fine vessels, etc.

果实横切面组织图注

1. 外果皮	为1列扁平细胞，外被角质层。
2. 中果皮	纵棱中部有维管束，背面纵棱间各有大的椭圆形油管1个，接合面有2个，共有6个。
3. 维管束	韧皮部位于木质部两侧上方，维管束周围有木化网纹细胞。
4. 内果皮	为1列扁平薄壁细胞。
5. 种皮	细胞扁长，含棕色物。
6. 胚乳	细胞含糊粉粒及细小草酸钙簇晶。
7. 油管	由数十个红棕色扁小分泌细胞组成。
8. 胚	小，位于胚乳的中央。
9. 种脊维管束	由若干细小导管组成。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Pericarp epidermis	Subpolygonal or subsquare on the surface view; with slightly thickened walls; stomata subrounded and anomocytic type.
2. Mesocarp reticulate cells	Pale yellow; subrectangular or sub-oblong; with thickened and slightly lignified walls; pits reticulate, relatively big and ovate.
3. Endocarp inlaid layer cells	On the surface view, cells wide and slender; with thin walls; usually several cells of a group irregularly inlaid along their long axes. Inlaid layer cells usually overlapped with relatively big polygonal mesocarp cells.
4. Fragments of vittae	Yellowish-brown or dark reddish-brown; secretory cells usually covered by secretion.
5. Endosperm cells	Subpolygonal; with thickened walls; intercellular layer indistinct; lumina containing aleurone granules.

图注

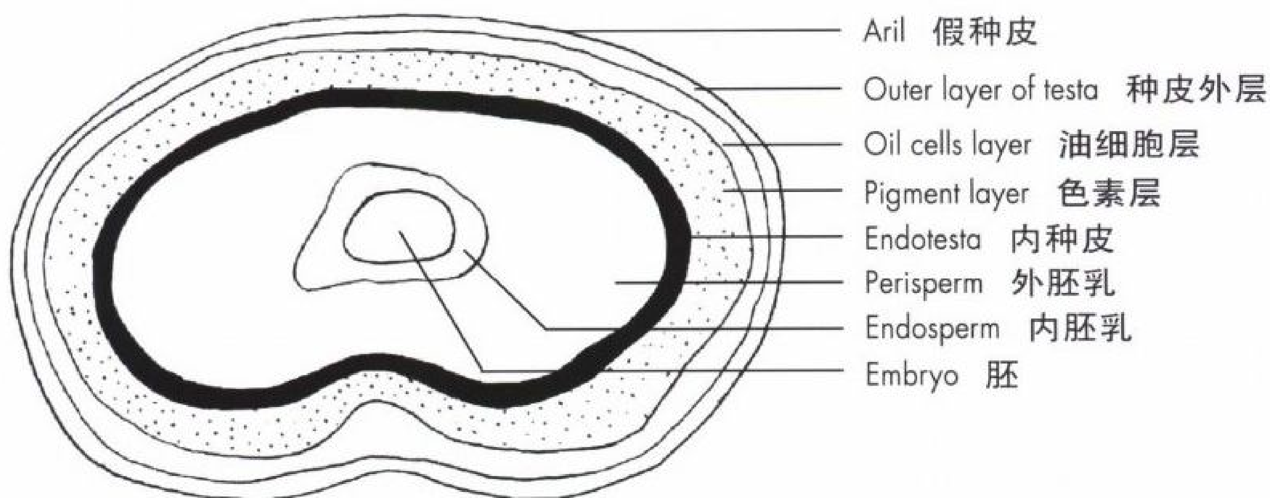
1. 果皮表皮	表面观细胞呈类多角形或类方形，壁稍增厚，气孔类圆形，不定式。
2. 中果皮网状细胞	淡黄色，类长方形或类长圆形，壁厚，微木化，具网状纹孔，纹孔较大，卵圆形。
3. 内果皮镶嵌层细胞	表面观细胞宽狭长，壁薄，常数个细胞为一组，以其长轴作不规则方向嵌列。镶嵌层细胞常与较大的多角形中果皮细胞重叠。
4. 油管碎片	黄棕色或深红棕色，分泌细胞常为分泌物所覆盖。
5. 胚乳细胞	呈类多角形，壁厚，胞间层不分明，细胞含糊粉粒。

红豆蔻 Hongdoukou

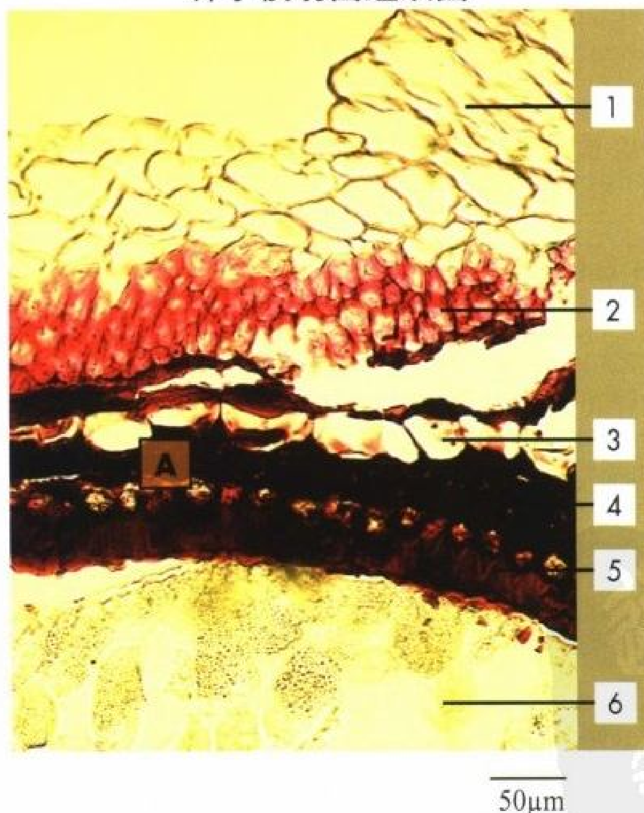


The dried ripe fruit of *Alpinia galanga* Willd. (Fam. Zingiberaceae).
姜科植物大高良姜的干燥成熟果实。

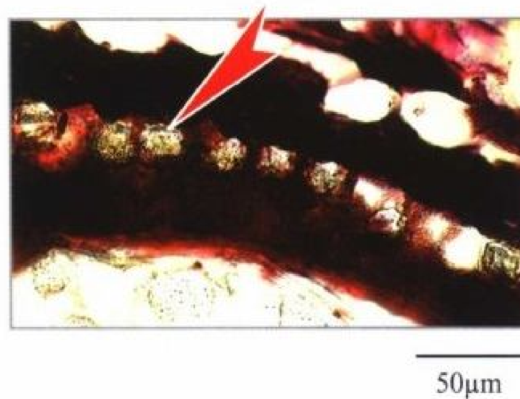
Sketch of transverse section of seed
种子横切面简图



Transverse section of seed
种子横切面组织图



A **Cell of endopleura "↯" showing silica mass**
内种皮细胞"↯"示硅质块

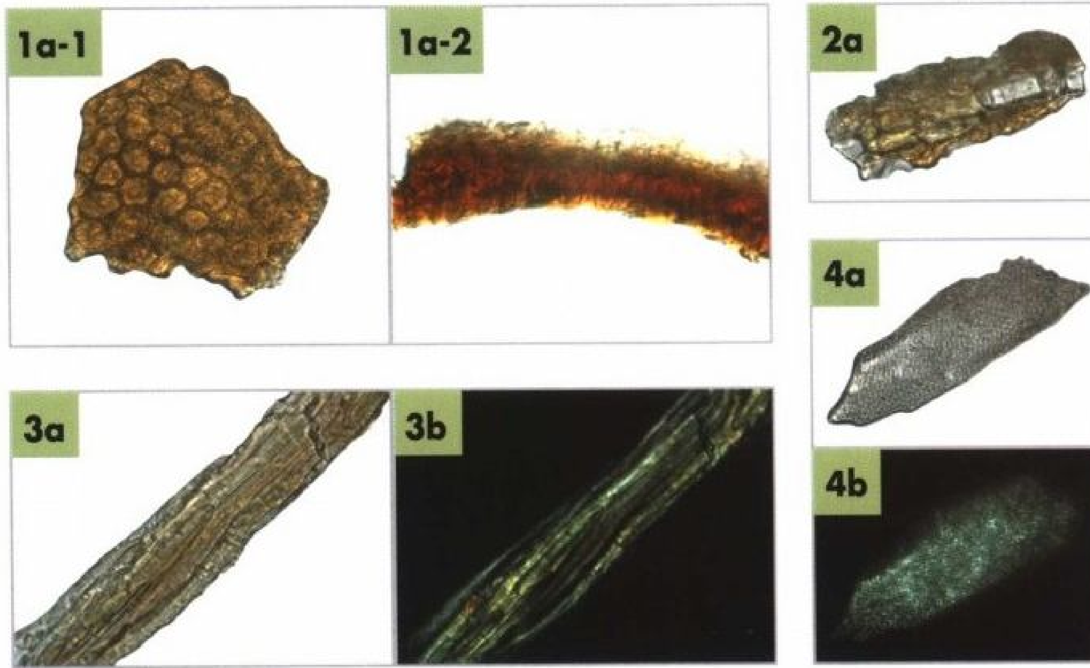


Transverse section of seed

1. Aril cells	4~7 rows, rounded or tangentially elongated; walls thickened.
2. Outer layer of testa	Consisting of 1~5 rows non-lignified and sclerenchymatous fibres; rounded or polygonal, 13~45μm in diameter; and 1 row of flat, yellowish-brown or dark-brown pigment cells beneath them.
3. Oil cells layer	1 row of cells, square or rectangular, 16~54μm in diameter.
4. Pigment layer	3~5 rows of cells, containing reddish-brown contents.
5. Endotesta	Consisting of 1 row sclerenchymatous palisade cells, about 65μm long and 30μm wide; yellowish-brown or reddish-brown, the internal walls and inner lateral walls extremely thickened; lumina nearby outside, containing silica masses.
6. Perisperm	Filled with masses of starch granules in cells, occasionally containing small prisms of calcium oxalate. The cells in endosperm containing aleurone granules and fatty oil droplets.

种子横切面组织图注

1. 假种皮细胞	4~7列，圆形或切向延长，壁稍厚。
2. 种皮外层	为1~5列非木化厚壁纤维，呈圆形或多角形，直径13~45μm，其下为1列扁平的黄棕色或深棕色色素细胞。
3. 油细胞层	1列细胞，方形或长方形，直径16~54μm。
4. 色素层	3~5列细胞，含红棕色物。
5. 内种皮	为1列栅状厚壁细胞，长约65μm，宽约30μm，黄棕色或红棕色，内壁及靠内方的侧壁极厚，胞腔偏外侧，内含硅质块。
6. 外胚乳	细胞中充满淀粉粒团，偶见草酸钙小方晶。内胚乳细胞含糊粉粒及脂肪油滴。



Notes

1. Sclerenchymatous cells of endotesta	In groups, reddish-brown or yellowish-brown; On the surface view (1a-1): polygonal or subsquare; non-lignified; lumina containing silica masses. In the section view (1a-2): cells arranged in the form of palisade, lumina at one end, containing silica masses.
2. Oil cells	Distributed between hypodermis and pigment layer; 1 row of cells in the section view, rectangular or square, containing oil droplets.
3. Fibres	Usually in bundles; long fusiform in shape; walls thick and non-lignified; lumina linear. Yellowish-green in color observed under a polarizing microscope.
4. Perisperm	Filled with starch granules clumps; small prisms of calcium oxalate occasionally present.

图注

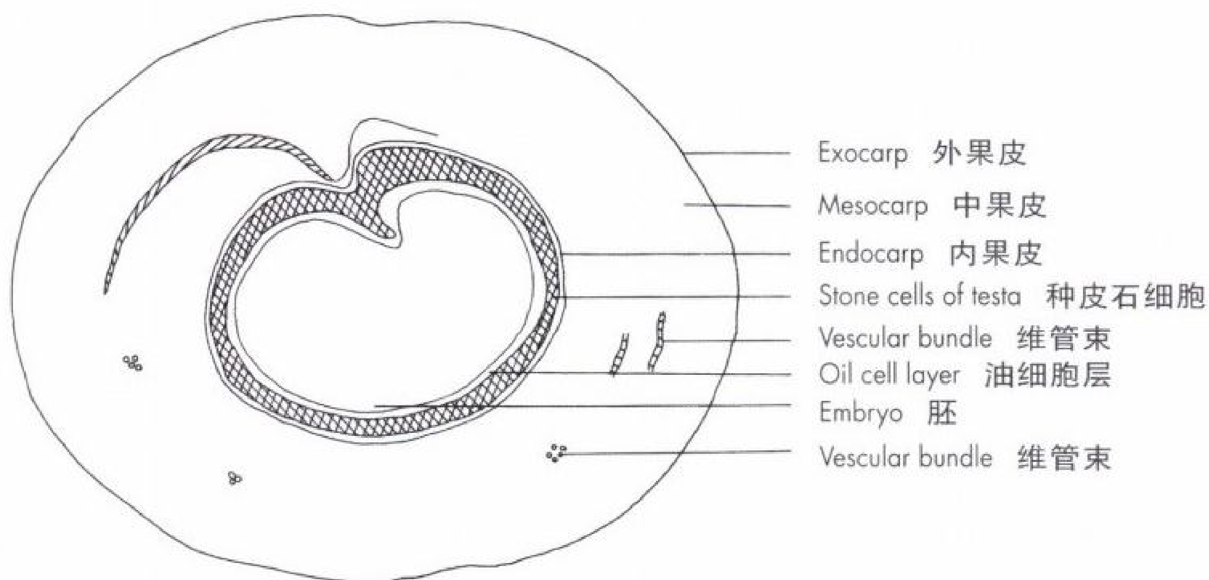
1. 内种皮厚壁细胞	成片，红棕色或黄棕色，表面观(1a-1)：多角形或类方形，非木化，胞腔内含硅质块；断面观(1a-2)：细胞排列成栅状，胞腔位于一端，内含硅质块。
2. 油细胞	位于下皮与色素层之间，切面观细胞1列，长方形或方形，内含油滴。
3. 纤维	大多成束，长梭形，壁厚，非木化，胞腔线型。偏光下黄绿色。
4. 外胚乳	充满淀粉粒团，偶见草酸钙小方晶。



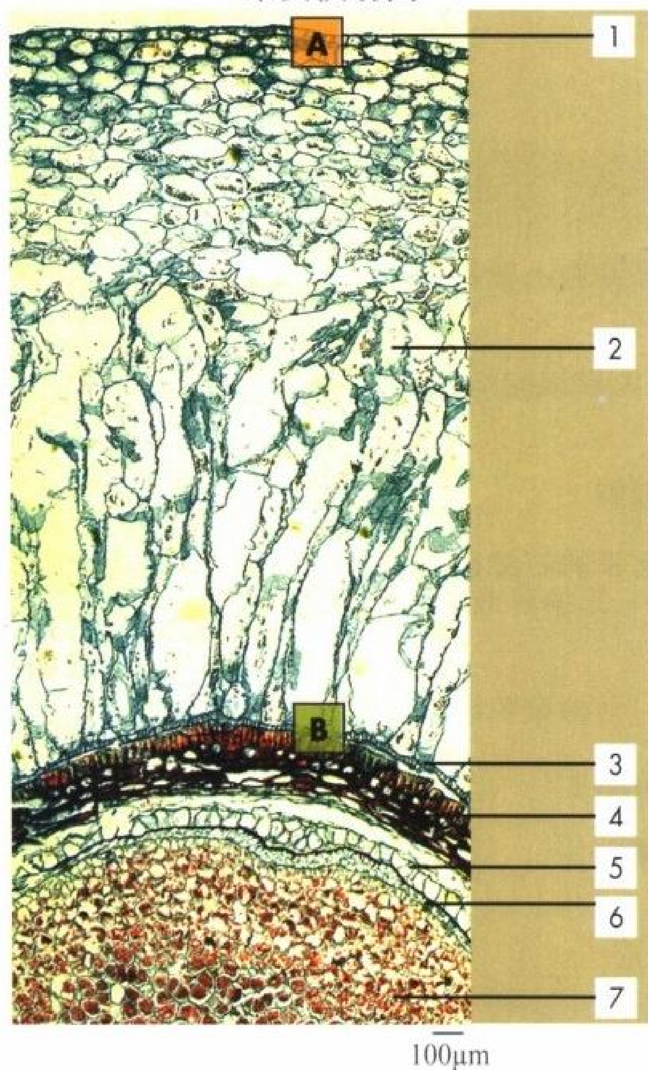
五味子 Wuweizi

The dried ripe fruit of *Schisandra chinensis* (Turcz.)Baill. (Fam. Magnoliaceae).
木兰科植物五味子的干燥成熟果实。

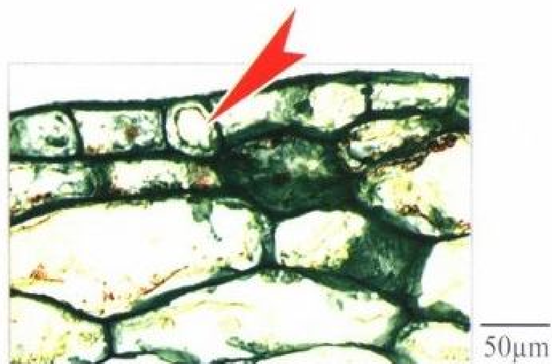
Sketch of transverse section of fruit
果实横切面简图



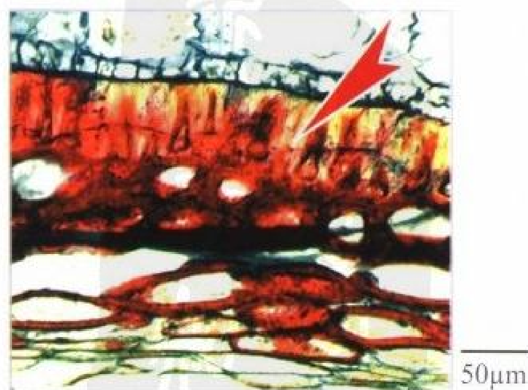
Transverse section of fruit
果实横切面



A Exocarp "↗" showing oil cell
外果皮 "↗" 示油细胞



B Stone cells of testa
种皮石细胞

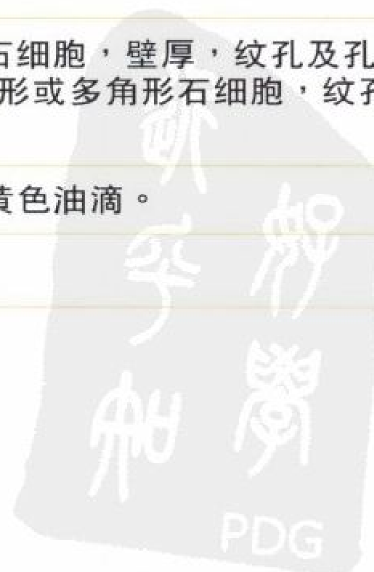


Transverse section of ripe fruit

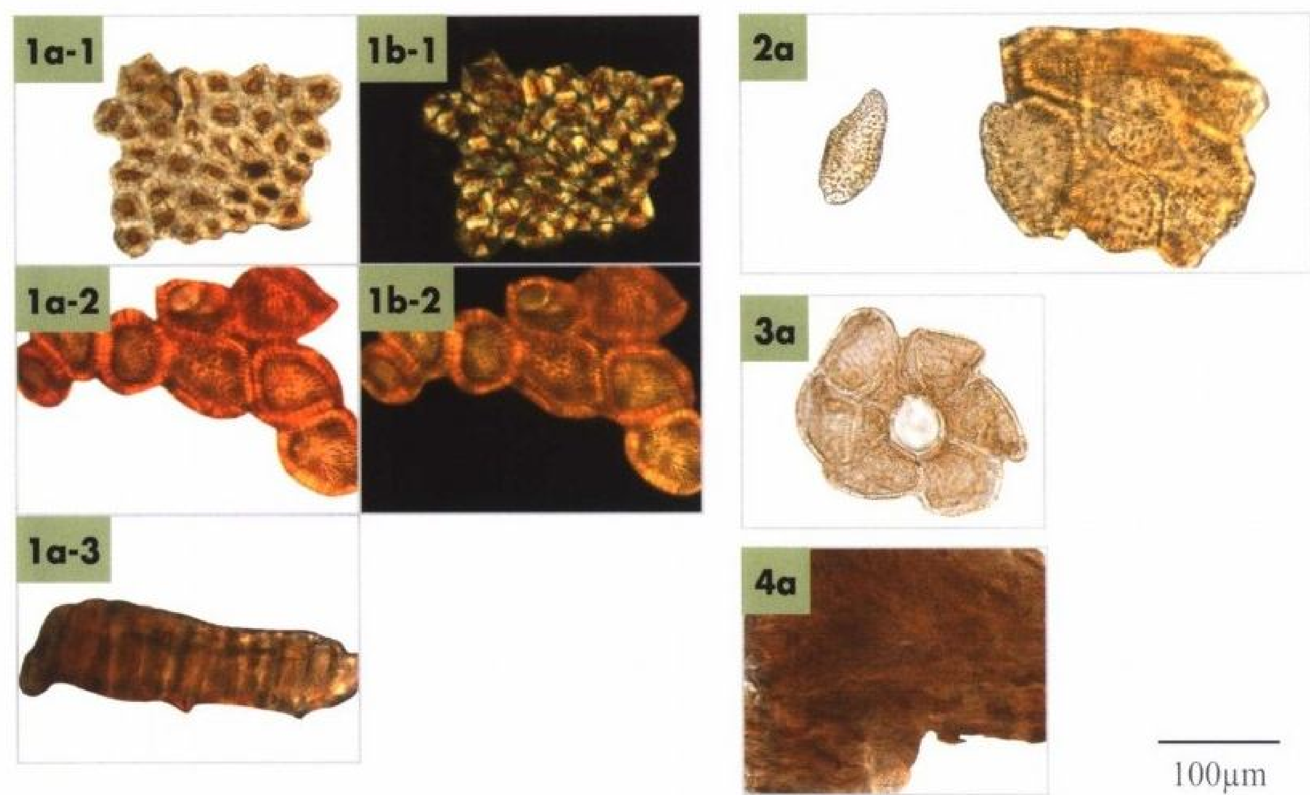
1. Exocarp	Consisting of 1 layer of square or rectangular cells, walls relatively thickened, covered with cuticles, oil cells scattered.
2. Mesocarp	Consisting of more than 10 layers of parenchymatous cells, inside cells tangentially elongated, scattered with small collateral bundles.
3. Endocarp	1 layer of small square parenchymatous cells.
4. Epidermis of Testa	Outermost showing 1 layer of radially elongated stone cells, thick-walled; with fine and dense pits and pit canals; beneath epidermis showing several layers of stone cells, subrounded, triangular or polygonal in shape, with larger and sparse pits.
5. Oil Cell Layer	Consisting of 1 layer of rectangular cells; containing brownish-yellow oil drops.
6. Inner Epidermal Cells of Testa	Consisting of 1 layer of small cells; slightly thick-walled.
7. Endosperm Cells	Containing fatty oil droplets and aleurone grains.

果实横切面组织图注

1. 外果皮	为1列方形或长方形细胞，壁稍厚，外被角质层，散有油细胞
2. 中果皮	薄壁细胞10余层，内侧细胞切向延长；散有小型外韧型维管束。
3. 内果皮	为1列小方形薄壁细胞。
4. 种皮表皮	最外层为1列径向延长的石细胞，壁厚，纹孔及孔沟细密；其下为数列类圆形、三角形或多角形石细胞，纹孔较大而疏。
5. 油细胞层	为1列长方形细胞，含棕黄色油滴。
6. 种皮内表皮	为1列小细胞，壁稍厚。
7. 胚乳细胞	含脂肪油滴及糊粉粒。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermal stone cells of testa	Surface view of outer lateral walls (1a-1): polygonal or long polygonal; even in size; with thickened walls and indistinct boundaries. Surface view of inner lateral walls (1a-2): with very fine and dense pit canals and distinct lumina; containing brown masses. Longitudinal section view (1a-3): rectangular; with fine or indistinct pits and pit canals.
2. Inner layer stone cells of testa	Polygonal, subrounded or irregular on the surface view, with slightly thickened walls; pits and pit canals distinct.
3. Epidermis of pericarp	Subpolygonal in surface view, anticlinal walls slightly beaded thickened and cuticular linear texture in surface; oil cells and stomata scattered in epidermis.
4. Mesocarp cells	Shrinked; with indistinct boundaries; containing reddish-brown masses.

图注

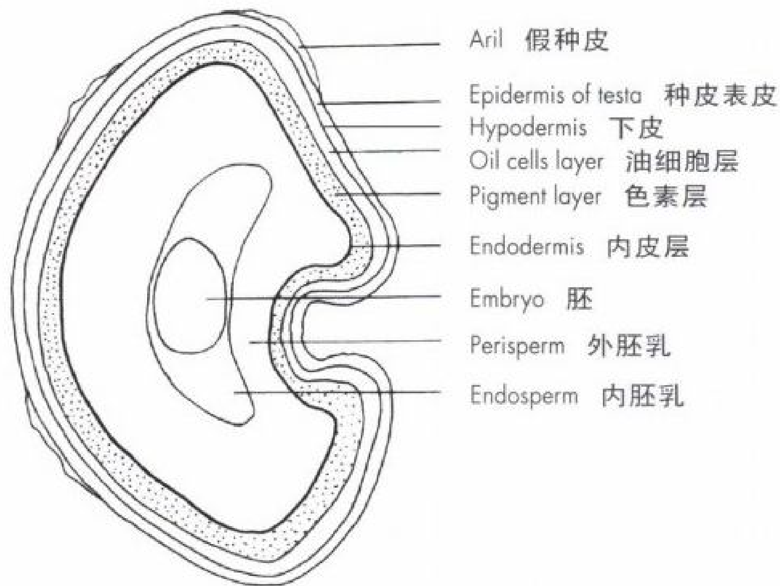
1. 种皮表皮石细胞	外侧壁表面观(1a-1)：呈多角形或长多角形，大小均匀，壁厚，界限不清；内侧壁细胞表面观(1a-2)：孔沟极细密，胞腔明显，内含棕色物。纵断面观(1a-3)：呈长方形，壁孔及孔沟细小或不明显。
2. 种皮内层石细胞	表面观呈多角形、类圆形或不规则形。壁稍厚，纹孔及孔沟明显。
3. 果皮表皮细胞	表面观类多角形，垂周壁呈连珠状增厚，表面有角质纹线，表皮中散有油细胞及气孔。
4. 中果皮细胞	皱缩，界限不明显，含红棕色物。

草果 Caoguo

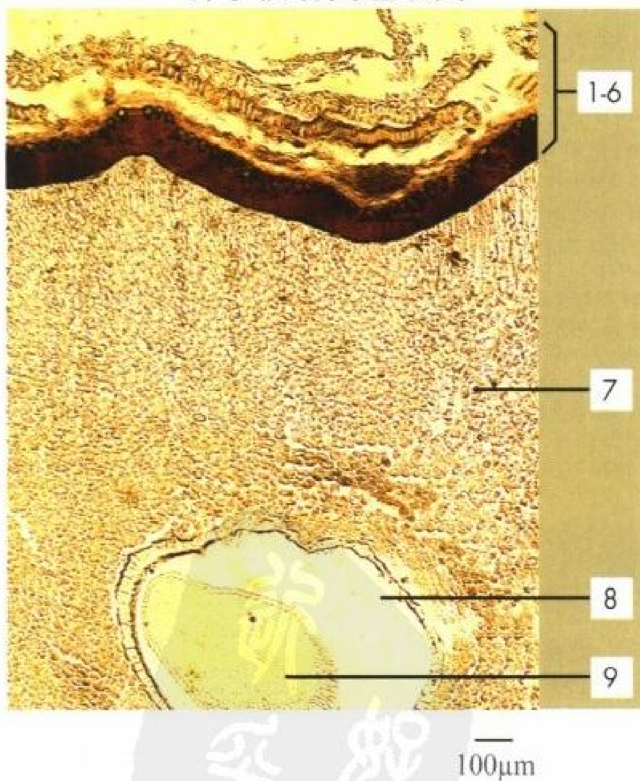


The dried ripe fruit of *Amomum tsao-ko* Crevost et Lemaire (Fam. Zingiberaceae).
姜科植物草果的干燥成熟果实。

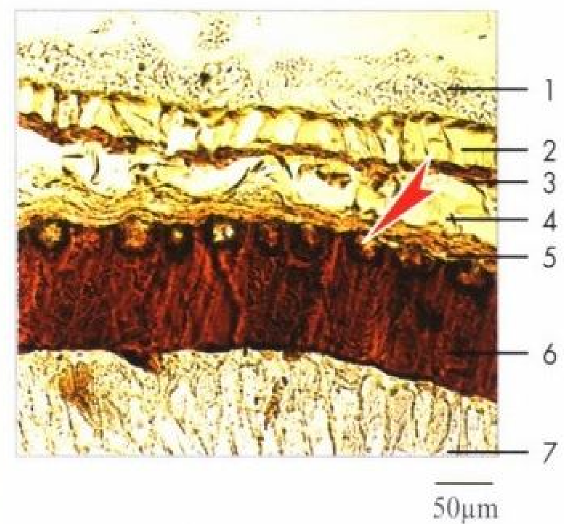
Sketch of transverse section of seed 种子横切面简图



Transverse section of seed 种子横切面组织图



A *Testa position, "➚" showing silica mas* 种皮部位,示硅质块



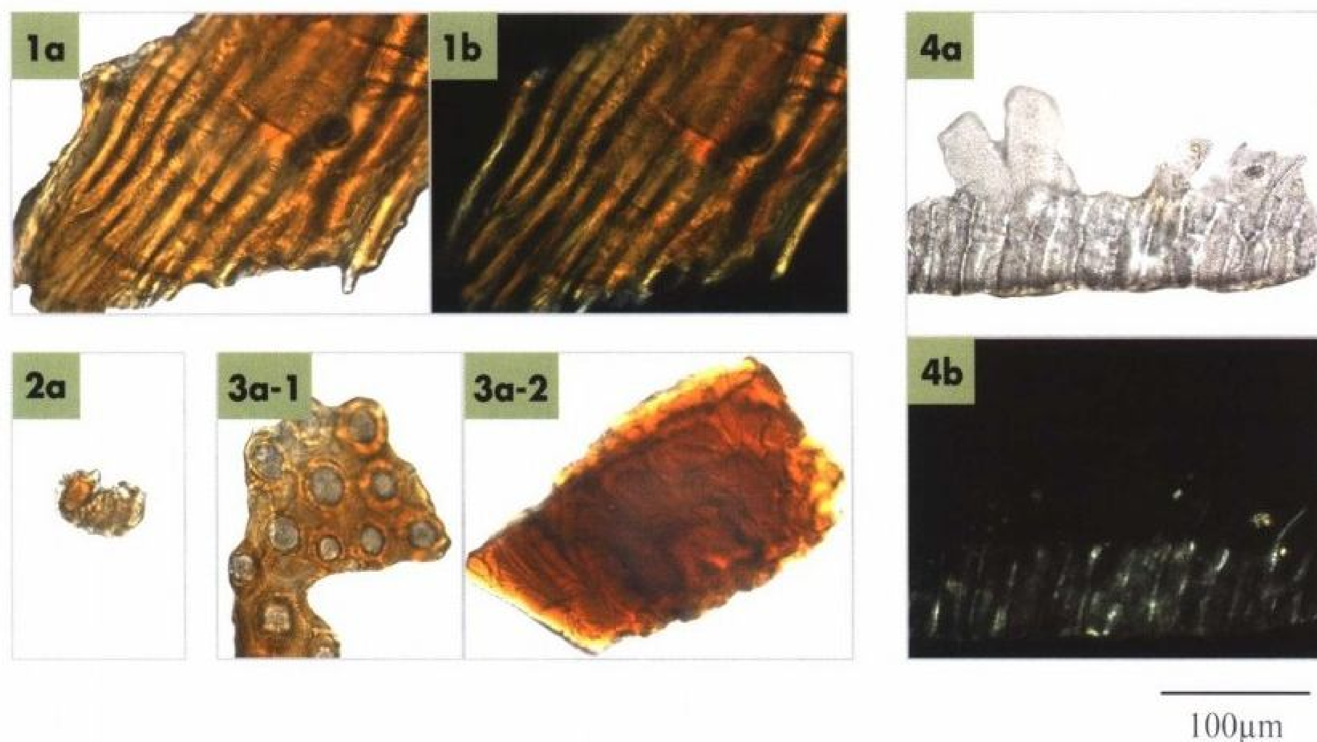
Transverse section of seed

1. Aril	Parenchymatous cells containing starch granules.
2. Epidermis of testa	Brown cells, rectangular with relatively thickened walls.
3. Hypodermis	Consisting of 1 row of parenchymatous cells, and containing yellow contents.
4. Oil cells layer	1 row of oil cells, subsquare or rectangular, 42~162μm tangentially, 48~68μm radially, containing yellow droplets.
5. Pigment layer	Consisting of several rows of brown cells, crimpled.
6. Endodermis	Consisting of 1 rows thick-walled palisade cells, brownish-red, the inner walls and the lateral walls very thickened and small lumina containing silica mass.
7. Perisperm	Cells containing starch granules and a few fine clusters and prisms of calcium oxalate.
8. Endosperm	Cells containing aleurone granules and starch granules.
9. Embryo	In the central part of endosperm.

种子横切面组织图注

1. 假种皮	薄壁细胞含淀粉粒。
2. 种皮表皮	细胞棕色，长方形，壁较厚。
3. 下皮	为1列薄壁细胞，含黄色物。
4. 油细胞层	为1列油细胞，类方形或长方形，切向42 ~ 162μm，径向48 ~ 68μm，含黄色油滴。
5. 色素层	为数列棕色细胞，皱缩。
6. 内皮层	为1列栅状厚壁细胞，棕红色，内壁与侧壁极厚，胞腔小，内含硅质块。
7. 外胚乳	细胞含淀粉粒及少数细小草酸钙簇晶及方晶。
8. 内胚乳	细胞含糊粉粒及淀粉粒。
9. 胚	居胚乳中央。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermis of testa	Strip-shaped on the surface view; with tapered or blunt endings; to 263μm long, 20~45μm in diameter, with cuticle layer outside.
2. Oil cells	Containing droplets.
3. Sclerenchymatous cells of endodermis	On the surface view(3a-1): polygonal or subrounded, cell walls about 7μm wide, non-lignified; lumina containing silica mass. In the cross-section view(3a-2): cells arranged in palisade-form, lumina at one end and containing silica masses.
4. Perisperm cells	Filled with starch clumps aggregated by fine starch granules, some containing fine prisms and clusters of calcium oxalate.

图注

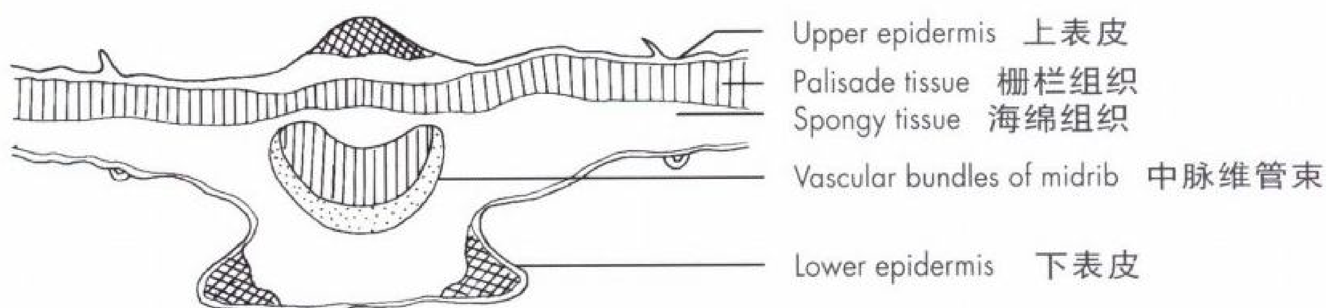
1. 种皮表皮细胞	表面观长条形，末端渐尖或钝圆，长至263μm，直径20~45μm，外具角质层。
2. 油细胞	含有油滴。
3. 内种皮厚壁细胞	表面观(3a-1)：多角形或类圆形，壁厚约7μm，非木化，胞腔内含硅质块；切面观(3a-2)：细胞排列成栅状，胞腔位于一端，内含硅质块。
4. 外胚乳细胞	充满由微小淀粉粒集结而成的淀粉团，有的尚含有细小草酸钙方晶和簇晶。

穿心莲 Chuanxinlian

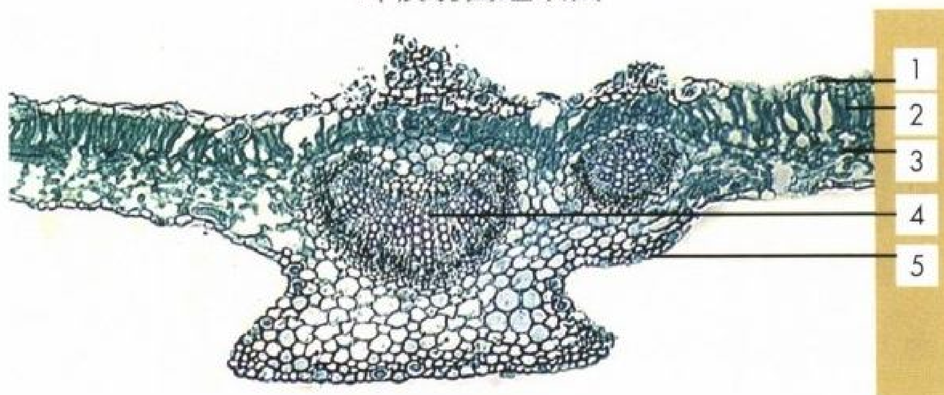


The dried aerial part of *Andrographis paniculata* (Burm.f.) Nees (Fam. Acanthaceae).
爵床科植物穿心莲的干燥地上部分。

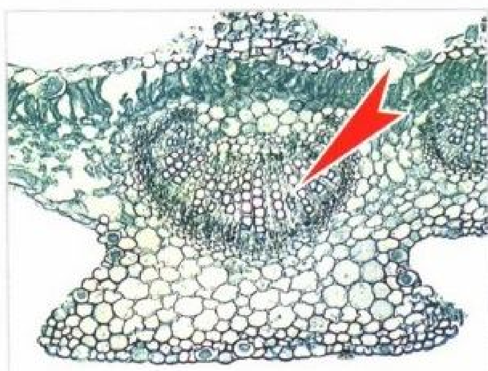
Sketch of transverse section of leaf
叶横切面简图



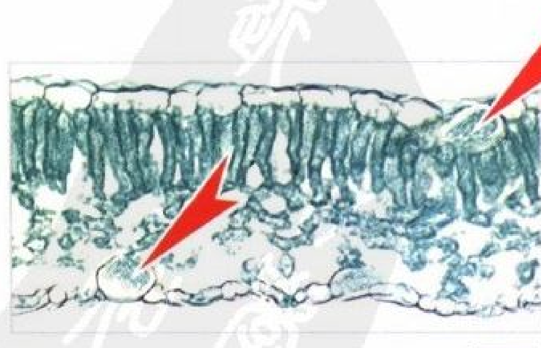
Transverse section of leaf
叶横切面组织图



A *Vascular bundle of midrib*
中脉维管束



B *Upper and lower epidermis with crystal cells containing cystoliths*
上、下表皮有含钟乳体的晶细胞



Transverse section of leaf

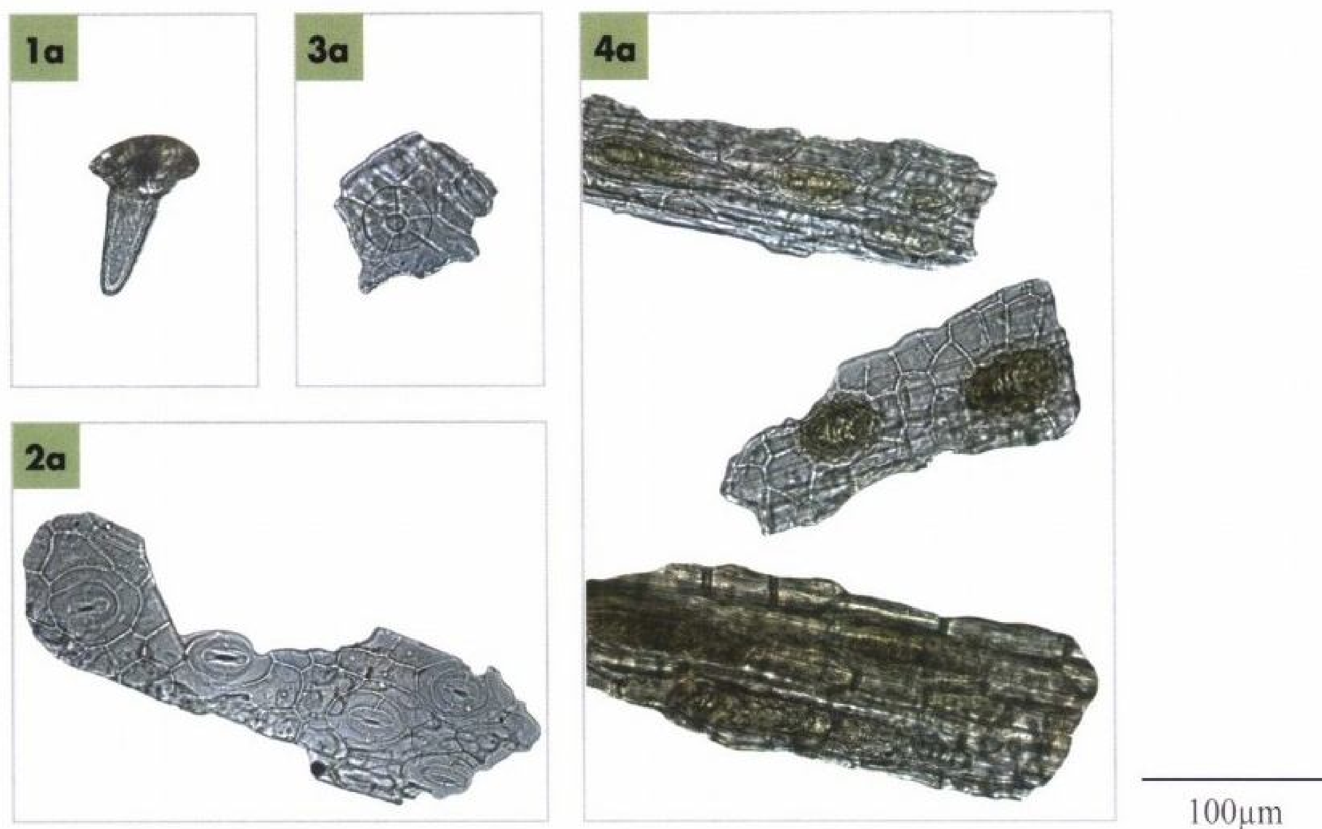
1. Upper epidermis	Cells subsquare or rectangular.
2. Palisade tissue	Consisting of 1~2 rows of cells; penetrating upper part of the midrib.
3. Spongy tissue	Arranged loosely.
4. Vascular bundles of midrib	Collateral and gab-shaped; containing crystal cells above the xylem.
5. Lower epidermis	Cells relatively small. Both upper and lower epidermis containing rounded and long-elliptical crystals or clavate cytolites. Some of epidermal cells with glandular scales or non-glandular hairs.

叶横切面组织图注

1. 上表皮	细胞类方形或长方形。
2. 栅栏组织	为1~2列细胞，贯穿于主脉上方。
3. 海绵组织	排列疏松。
4. 中脉维管束	外韧型，呈凹槽状，木质部上方亦有晶细胞。
5. 下表皮	细胞较小，上、下表皮均有含圆形、长椭圆形或棒状钟乳体的晶细胞，并有腺鳞，有的可见非腺毛。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Non-glandular hairs	1~4 cells; about up to 160μm long; about up to 40μm in the basal diameter; with cuticle striations on the surface view.
2. Epidermis	Stoma diacytic or anomocytic; subsidiary cells significantly varying in size.
3. Glandular scales	Head oblate; 4~8 cells; with very short stalk.
4. Crystal cells	Subsquare or rectangular; containing rounded, elliptical or club-shaped cytolites.

图注

1. 非腺毛	1~4个细胞，长约至160μm，基部直径约至40μm；表面有角质纹理。
2. 表皮	气孔直轴式或不定式，副卫细胞大小悬殊。
3. 腺鳞	头部扁球形，4~8个细胞，柄极短。
4. 晶细胞	类方形或长方形，内含圆形、椭圆形或棒状钟乳体。



小蓟 Xiaoji

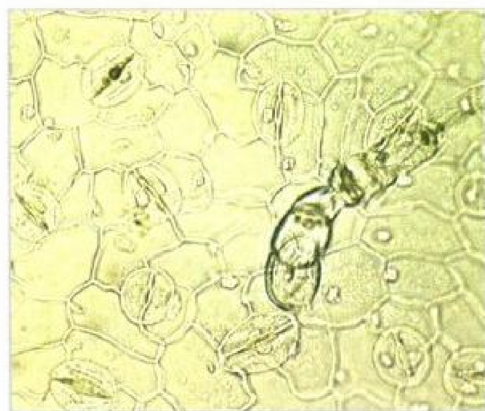
The aerial part of *Cirsium setosum* (Willd.) MB. (Fam. Compositae).
菊科植物刺儿菜的地上部分。

1 ***Upper epidermis***
上表皮



50μm

2 ***Lower epidermis***
下表皮



50μm

3 ***Non-glandular hairs***
非腺毛



50μm

4 ***Mesophyll tissue containing crystals of calcium oxalate***
叶肉组织含有草酸钙晶体



50μm

Surface view of leaf

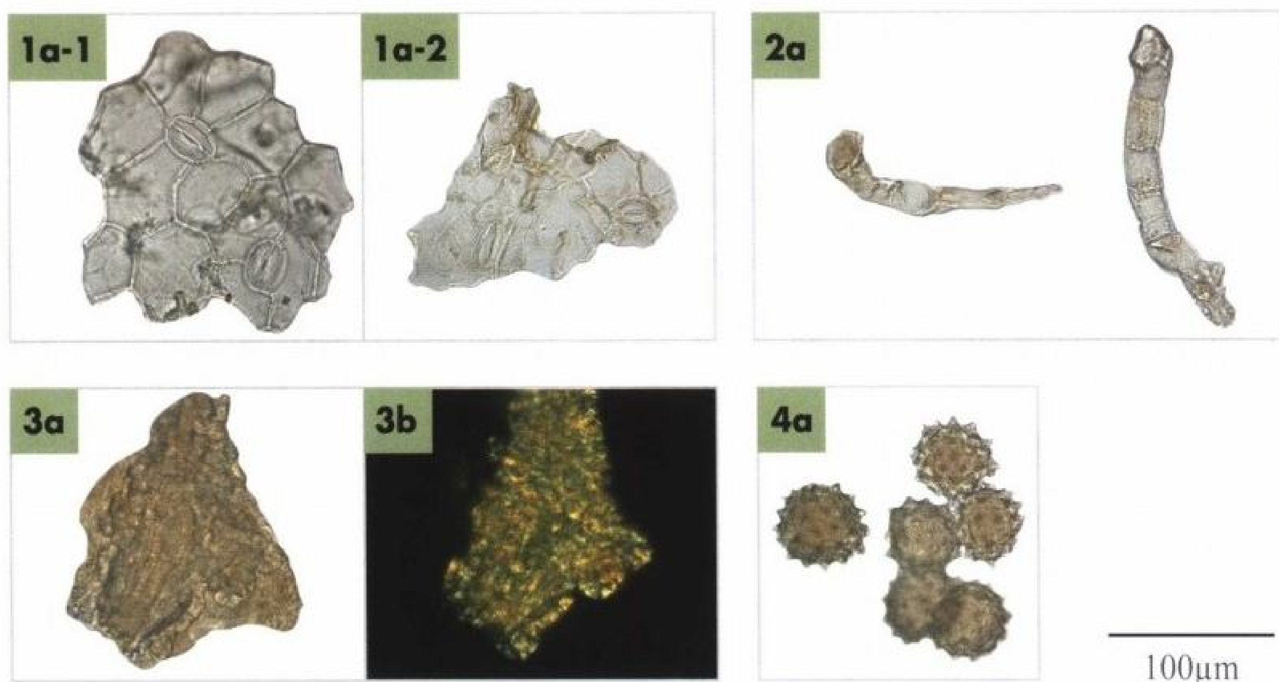
1. Upper epidermis	Cells polygonal; anticlinal walls straight, cutin striations distinct; stoma anomocytic.
2. Lower epidermis	Cells anticlinal walls undulate; stomata anomocytic or anisocytic.
3. Non-glandular hairs	Present in both upper epidermis and lower epidermis; 3~10 cells; with a long whip-shaped apical cell, crimpled and twisted.
4. Mesophyll tissue	Containing crystals of calcium oxalate; mostly needle-clustered.

叶表面观图注

1. 上表皮	细胞多角形，垂周壁平直，角质纹理明显；气孔不定式。
2. 下表皮	细胞壁波状弯曲；气孔不定式或不等式。
3. 非腺毛	上下表皮均可见，3~10细胞，顶端细胞甚长呈鞭状，皱缩扭曲。
4. 叶肉组织	含草酸钙结晶，多呈针簇状。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermal cells	Upper epidermal cells (1a-1): polygonal on the surface view; anticlinal walls straight; with distinct cuticle striations. Lower epidermal cells (1a-2): walls of cells simuous. Both upper and lower epidermal cells with stoma and non-glandular hairs; stomata anomocytic or anisocytic.
2. Non-glandular hairs	Mostly broken; 3~10 or even more cells; with top cell slender and whip-shaped, shrinked and distorted.
3. Clusters of calcium oxalate	Consisting in mesophyll cells; mostly needle-clustered.
4. Pollen grains	Subrounded, with 3 germinating ditches, spines visible on the surface.

图注

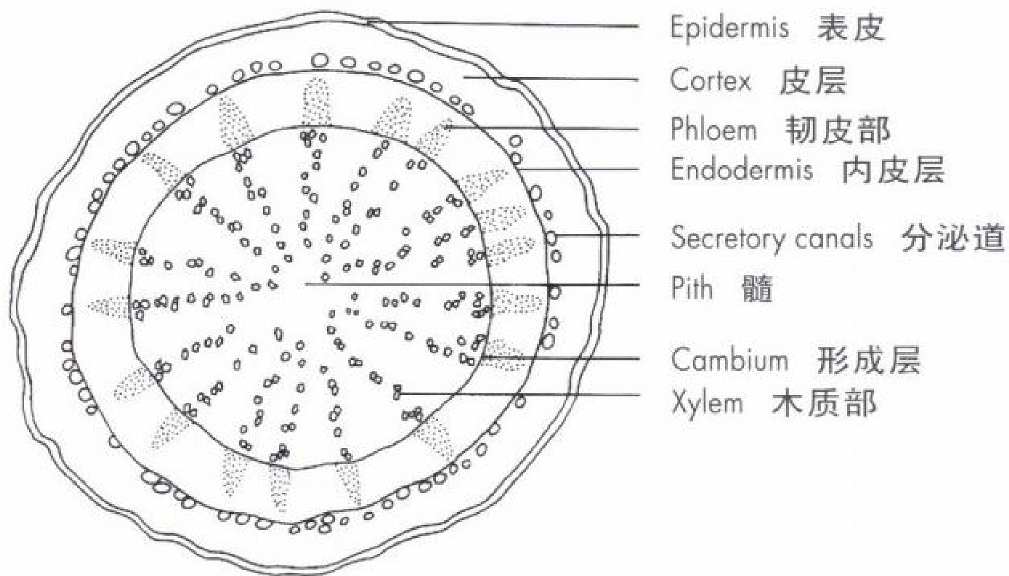
1. 表皮细胞	上表皮细胞(1a-1)：表面观多角形，垂周壁平直，角质纹理明显；下表皮细胞(1a-2)：壁波状弯曲；上下表皮均有气孔及非腺毛，气孔不定式或不等式。
2. 非腺毛	大多碎断，3~10余个细胞，顶端细胞甚细长呈鞭状，皱缩扭曲。
3. 草酸钙结晶	含于叶肉细胞中，多呈针簇状。
4. 花粉粒	类圆形，具3孔沟，表面有刺。



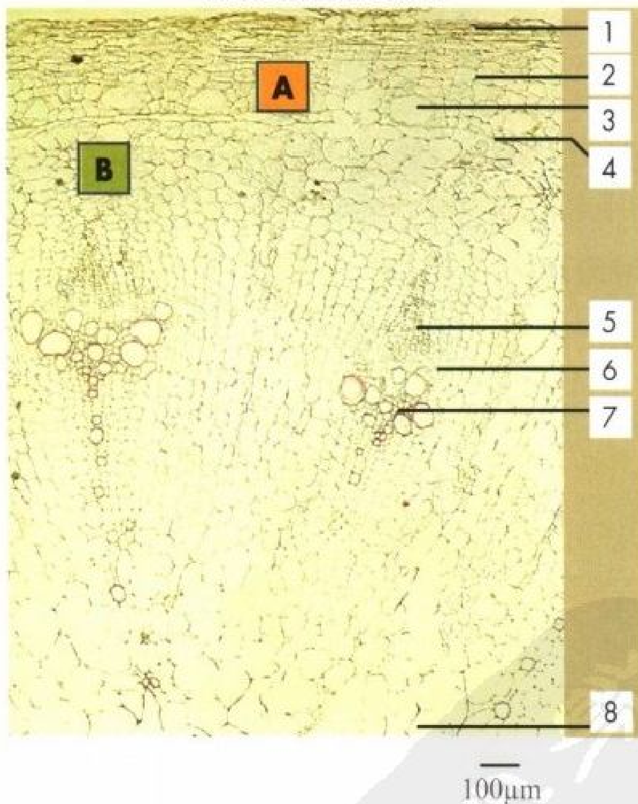
大蓟 Daji

The dried aerial part of *Cirsium japonicum* Fisch. ex DC. (Fam. Compositae).
菊科植物蓟干燥的地上部分。

Sketch of transverse section of root
根横切面简图

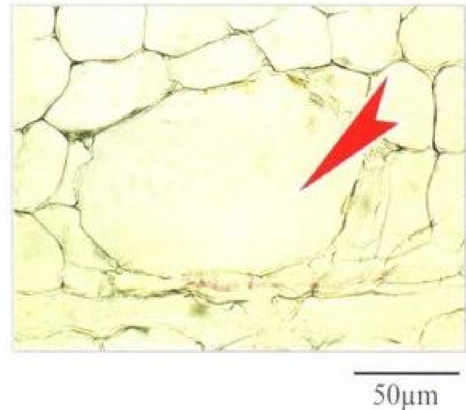


Middle part of root
根横切面组织图



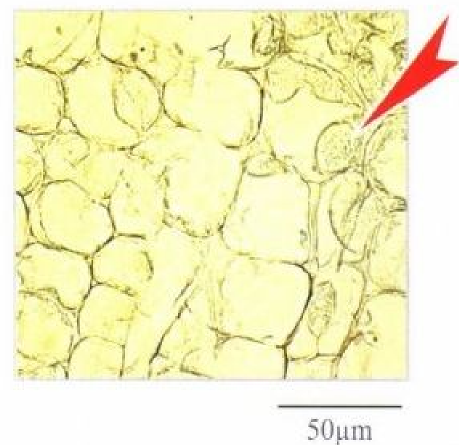
100μm

A *Secretory canal*
分泌道



50μm

B *Parenchymatous cells containing inulin*
薄壁细胞含菊糖



50μm

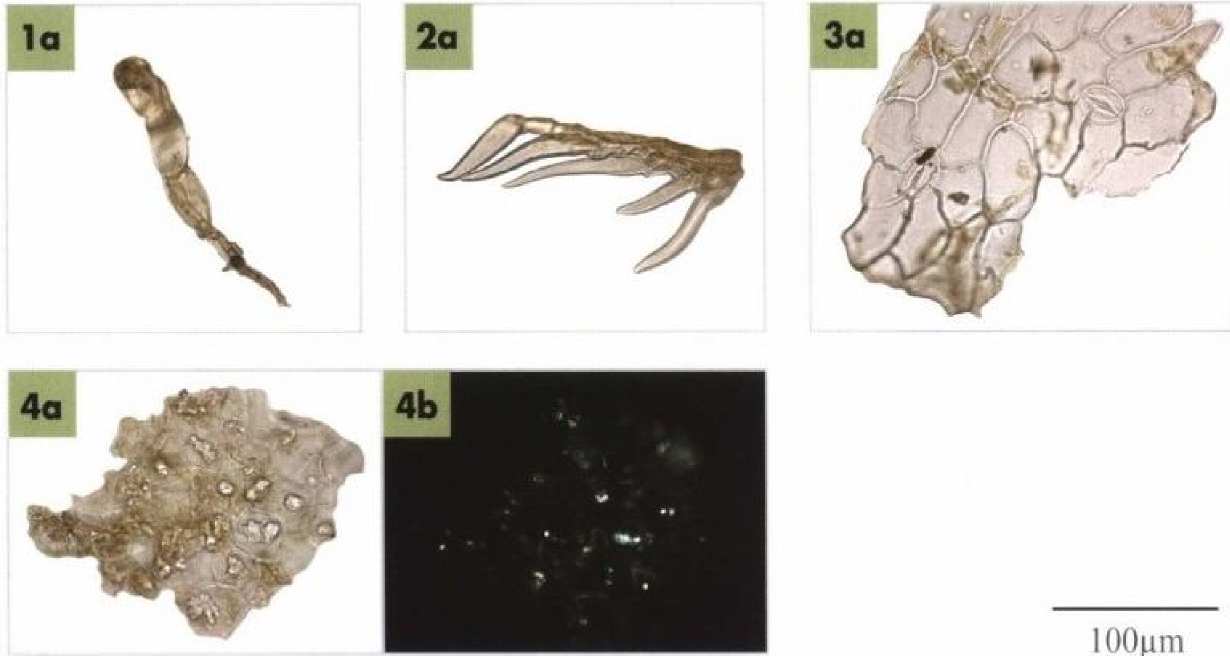
Transverse section of root

1. Epidermis	Cells with suberized walls, sometimes exfoliated.
2. Cortex	Broad, scattered with secretory canals.
3. Secretory canals	Subrounded, close to endodermis, about 80~150μm in diameter, densely arranged in a ring.
4. Endodermis	Distinct.
5. Phloem	Relatively narrow.
6. Cambium	In an interrupted ring.
7. Xylem	Rays relatively broad, with few vessels arranged radially and usually accompanied with xylem fibres.
8. Pith	Sometime hollowed in the center.
Parenchymatous cells	Containing inulin.

根横切面组织图注

1. 表皮	细胞壁木栓化，有时脱落。
2. 皮层	较宽，散有分泌道。
3. 分泌道	类圆形，紧靠内皮层，直径80~150μm，较密地排列成环。
4. 内皮层	明显。
5. 韧皮部	较窄。
6. 形成层	断续成环。
7. 木质部	射线较宽；导管少数，放射状排列，周围常伴有木纤维。
8. 髓	有时中空。
薄壁细胞	含菊糖。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Multicellular non-gland hairs	Extremely long, mostly broken, complete ones composed of 4~30 cells; 1~2 or several cells on the top very narrow and long; crimpled and twisted; some basal cells having thick walls and slightly curved cuticular striations, containing yellowish-brown contents.
2. Unicellular cell non-gland hairs	Different in length, top portion sharp or blunt, up to 17μm in diameter.
3. Leaf fragments	Upper epidermal cells sub-polygonal on the surface view, anticlinal walls slightly thickened or bead-like; lower epidermal cell walls sinuous; fine cuticular striations present on both lower and upper epidermises; stoma and trichomes present.
4. Crystals of calcium oxalate	Yellowish-green, occurred in leaf epidermis and mesophyllous cells; crystals clustered needle-like or fan-shaped, 3~18μm in diameter.

图注

1. 多细胞非腺毛	极长，多碎断，完整者4~30余细胞，顶端1~2或数个细胞甚细长，皱缩扭曲，有的基部细胞壁较厚，并有略弯曲的角质细条纹，有的细胞含黄棕色物。
2. 单细胞非腺毛	长短不一，先端尖或稍钝圆，直径约至17μm。
3. 叶片碎片	表面观上表皮细胞呈类多角形，垂周壁稍增厚或略呈连珠状；下表皮细胞壁波状弯曲。上下表皮都有微细的角质纹理，并有气孔及毛茸。
4. 草酸钙结晶	黄绿色，存在于叶表皮及叶肉细胞中。呈针簇状或扇形，直径3~18μm。

Herba Commelinae

鸭跖草 Yazhicao



The dried aerial part of *Commelina communis* L. (Fam. Commeliaceae).
鸭跖草科植物鸭跖草的干燥地上部分。

1 ***Short conical non-glandular hairs***
短锥形非腺毛



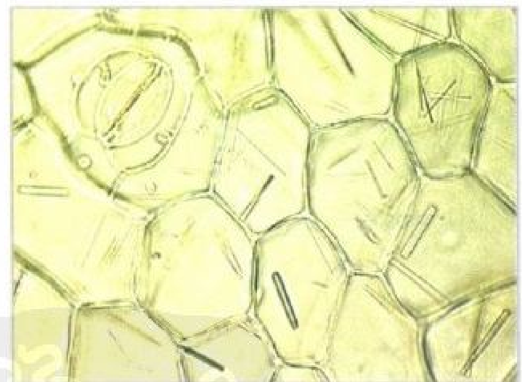


2 ***Clavate non-glandular hairs***
棒形非腺毛





3 ***Raphides of calcium oxalate***
草酸钙针晶



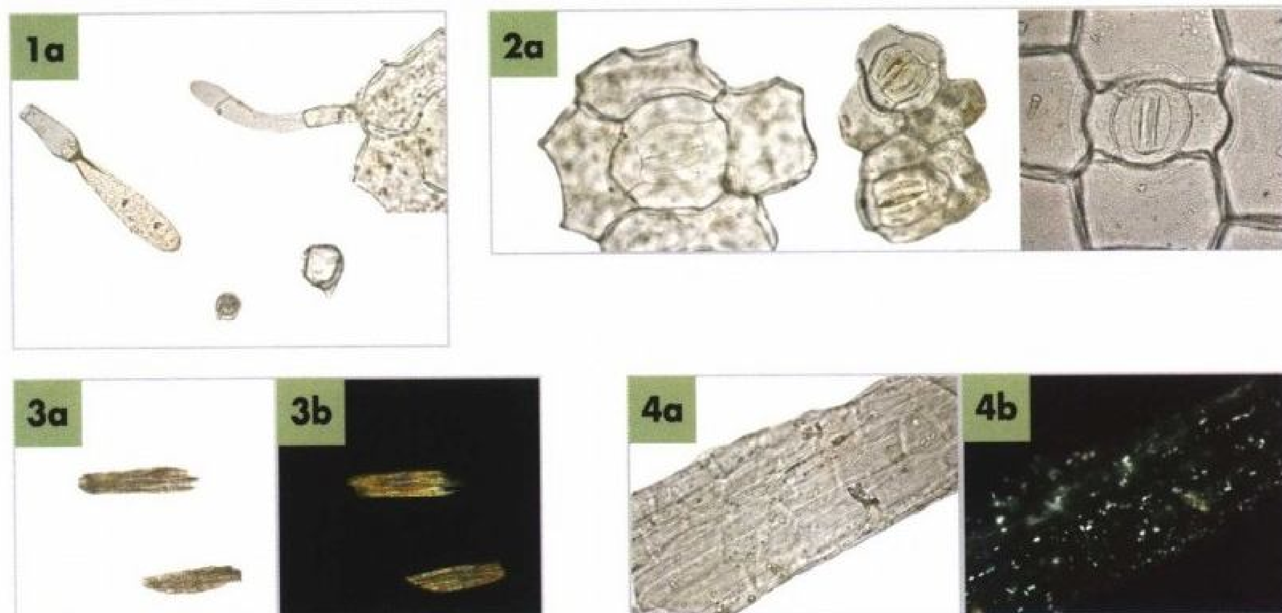
Surface view of leaf

1. Short conical non-glandular hairs	2 cells, 30~60μm long; with relatively thick walls, basal cells about 45μm in diameter; apical cells short and pointed.
2. Clavate non-glandular hairs	2 cells; basal cells about 45~60μm long, with relatively thick walls; apical cells relatively long, the apex blunt, thin-walled, usually fallen off.
3. Raphides of calcium oxalate	Abundant, up to 74μm long.

叶表面观图注

1. 短锥形非腺毛	2细胞，长30~60μm，壁较厚，基部细胞直径约45μm，顶端细胞短尖。
2. 棒形非腺毛	2细胞，基部细胞长45~60μm，壁较厚，顶端细胞较长，先端钝圆，壁薄，常脱落。
3. 草酸钙针晶	较多，长至74μm。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Non-glandular hairs	Two types, both of them bicellular. One type is short conical, 30~60μm long, with relatively thick walls, apical cell relatively sharp. The other one clavate, basal cell about 45~60μm long, with relatively thick walls, apical cell relatively long, the apex blunt, thin-walled, usually fallen off.
2. Stoma	Paracytic, slightly convex off the epidermis; subsidiary cells 4, left and right cells paralleled with guard cells, upper and lower cells vertical to guard cells.
3. Raphides of calcium oxalate	Abundant, in bundles or scattered, up to 74μm long. Brightly white separated by polychrome color observed under a polarizing microscope.
4. Pericarp cells	Slightly stip-shaped, walls of cell bead-like; prisms of calcium oxalate attached to the surface. Brightly white under a polarizing microscope.

图注

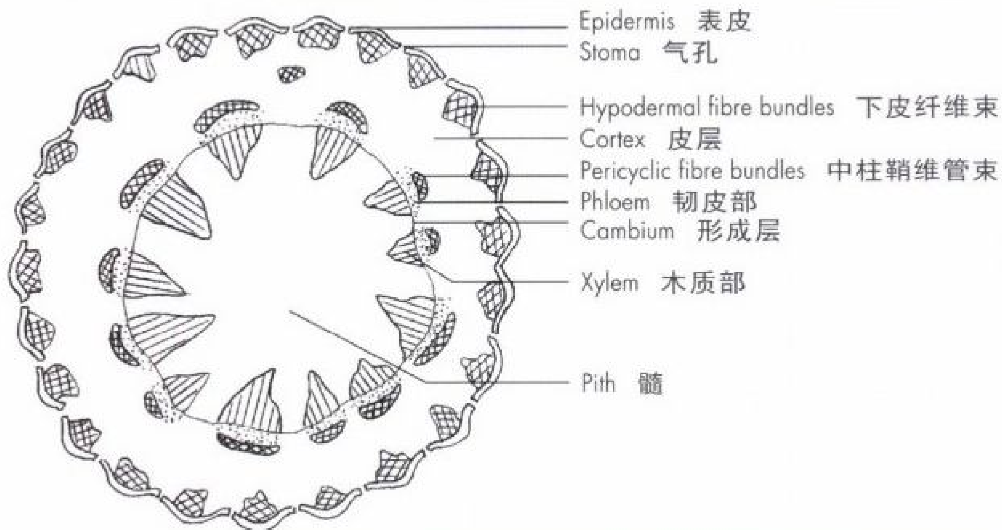
1. 非腺毛	两种，均为2个细胞，一种短锥形，长30~60μm，壁较厚，顶端细胞较尖；另一种棒形，基部细胞长45~60μm，壁稍厚，顶端细胞较长，先端钝圆，壁薄，常脱落。
2. 气孔	为平轴式，略突出表皮，副卫细胞4个，左、右与保卫细胞平列，上、下与保卫细胞直列。
3. 草酸钙针晶	较多，成束或散在，长约74μm。偏光显微镜下针晶呈亮白色间多彩色。
4. 果皮细胞	略呈长条形，细胞壁呈连珠状，表面常附着草酸钙方晶。偏光显微镜下方晶呈亮白色。

麻黄 Mahuang

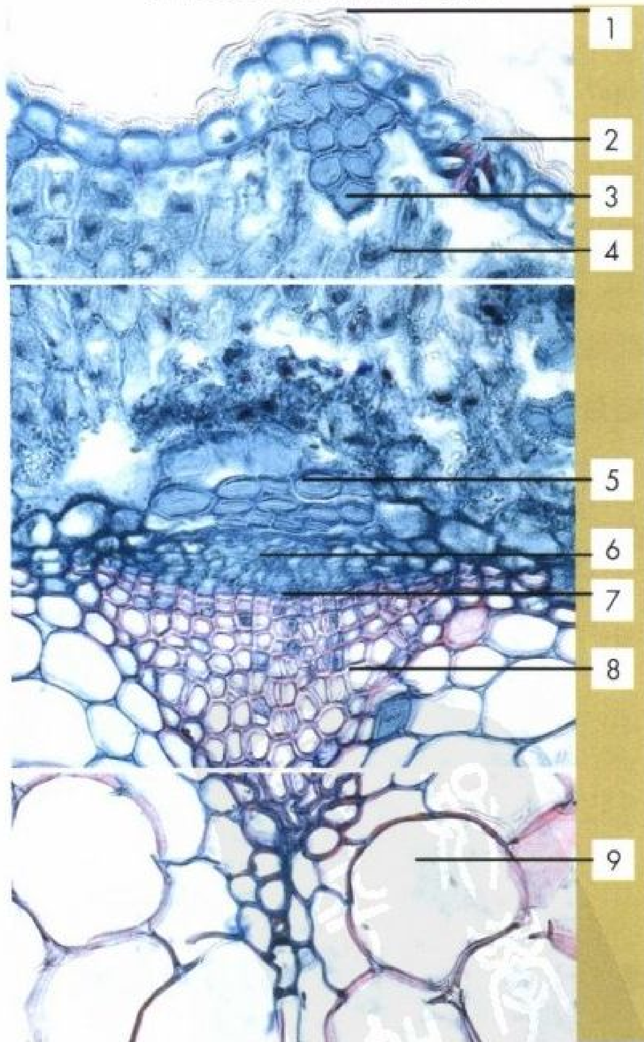


The herbaceous stem of *Ephedra sinica* Stapf. (Fam. Ephedraceae).
麻黄科植物草麻黄的干燥草质茎。

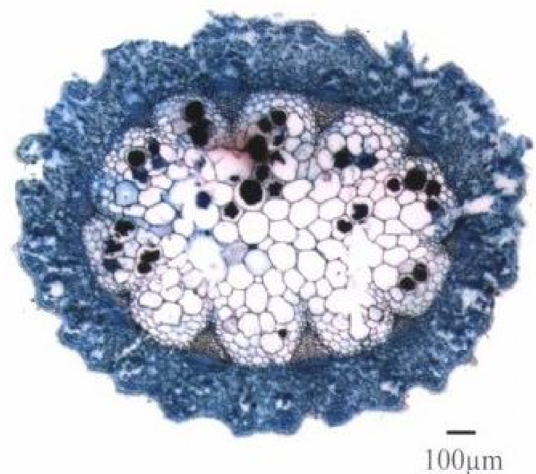
Sketch of transverse section of stem
茎横切面简图



Transverse section of stem (partial)
茎横切面组织图(局部)



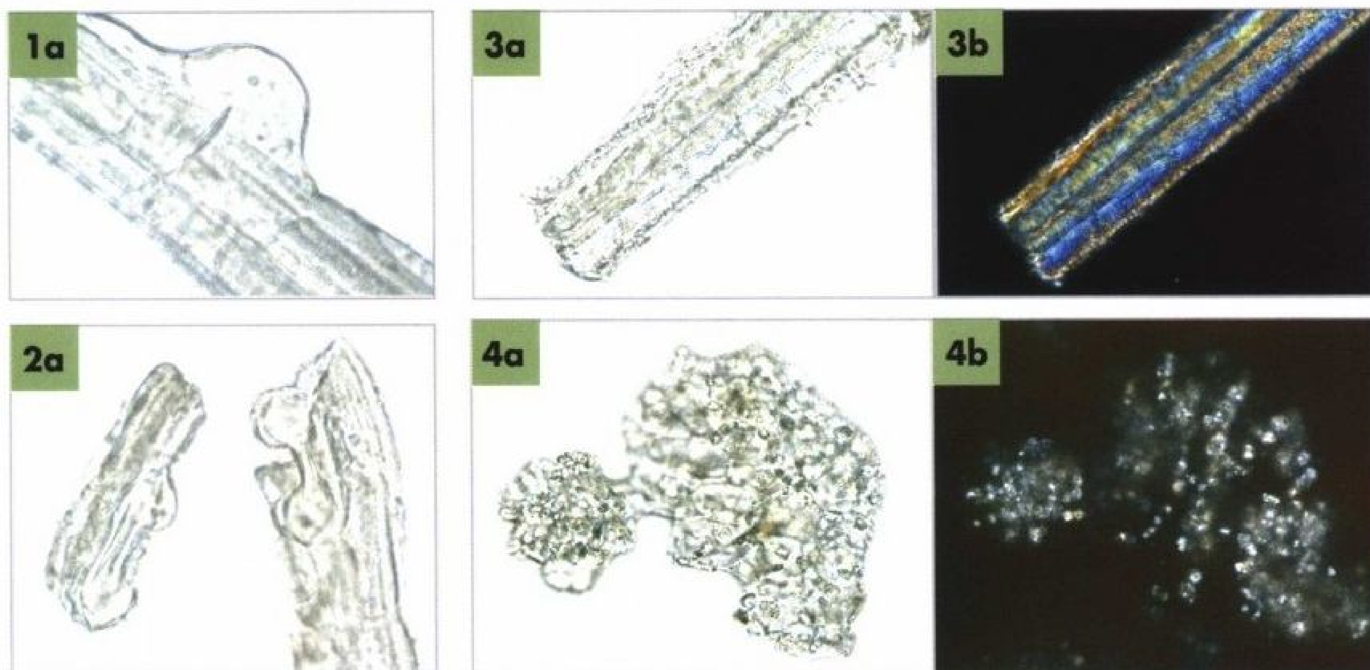
A *Transverse section of stem (whole)*
茎横切面组织图(整体)



Transverse section of stem	
1. Epidermis	Cells covered with cuticles, ridges relatively dense, with waxy warty protrudings.
2. Stomata	Sunken stomata located between two ridges.
3. Hypodermal fibre bundles	Located in ridges, with thickened and unlignified walls.
4. Cortex	Relatively broad, fibres bundles scattered.
5. Pericycle fibre bundles	Crescent.
6. Phloem	Collateral.
7. Cambium ring	Subrounded, in the form of a ring.
8. Xylem	Triangular.
9. Parenchymatous cells in pith	Containing brown masses.
Perimedullary fibres	Occasionally visible.
Sandy crystals or prisms of calcium oxalate	Scattered in the outer walls of epidermal cells, cortex parenchymatous cells and fibres.

草质茎横切面组织图注	
1. 表皮	细胞外被角质层，脊线较密，有蜡质疣状凸起。
2. 气孔	位于两脊线间有下陷处。
3. 下皮纤维束	位于脊线处，壁厚，非木化。
4. 皮层	较宽，纤维成束散在。
5. 中柱鞘纤维束	新月形。
6. 韧皮部	外韧型。
7. 形成层	类圆形，呈环状。
8. 木质部	呈三角状。
9. 髓部薄壁细胞	含棕色块。
环髓纤维	偶有。
草酸钙砂晶或方晶	散在于表皮细胞外壁、皮层薄壁细胞及纤维外壁。

Main Powder Characteristics
主要粉末显微特征



50μm

Notes

1. Epidermis fragments	Cells subrectangular in the cross-section view; outer walls densely scattered with fine granular crystals of calcium oxalate; cuticle layer rather thick; about up to 18μm; protuberant like ridges.
2. Stoma	Abundant; specially sunken stoma; long-rounded; guard cells telephone-shaped in lateral view.
3. Phloem fibers	Slender; 10~24μm in diameter; walls rather thick; primary walls scattered fine crystals of calcium oxalate. Polychrome observed under a polarizing microscope.
4. Sandy crystals of calcium oxalate	Located in epidermal cells, walls of phloem fibers and cortex parenchymatous cells. Bright white in color under a polarizing microscope.

图注

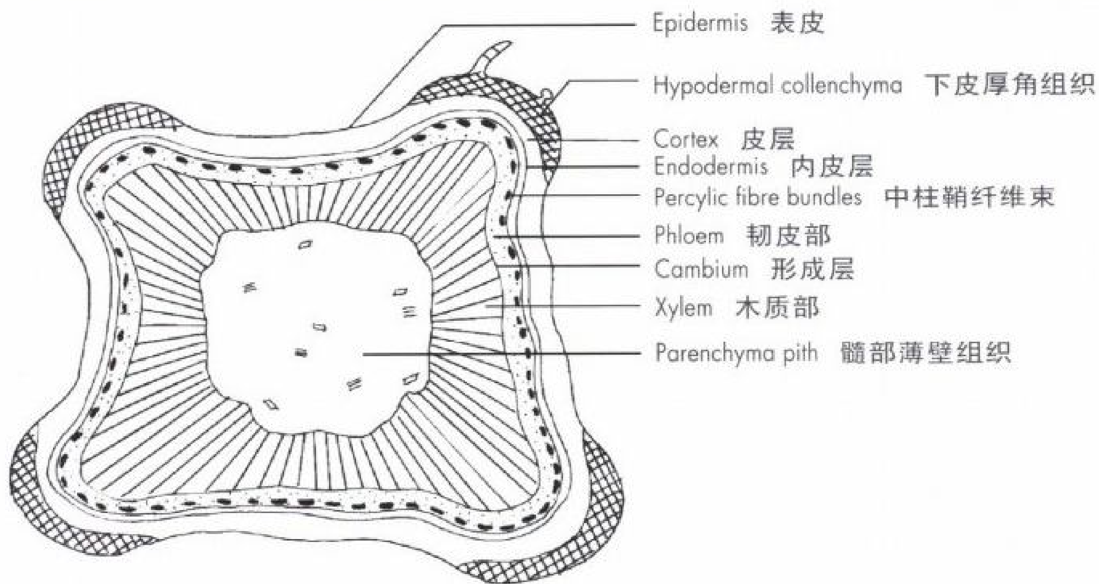
1. 表皮碎片	断面观细胞呈类长方形，外壁布满细小颗粒状草酸钙结晶，角质层极厚，约至18μm，呈脊状突起。
2. 气孔	常见，为特异的内陷气孔，长圆形，侧面观保卫细胞似电话筒状。
3. 皮部纤维	细长，直径10~24μm，壁极厚，初生壁上布满微小草酸钙结晶。偏光显微镜下呈多彩色。
4. 草酸钙砂晶	存在于表皮细胞、皮部纤维壁及皮层薄壁细胞中。偏光下呈亮白色。

益母草 Yimucao

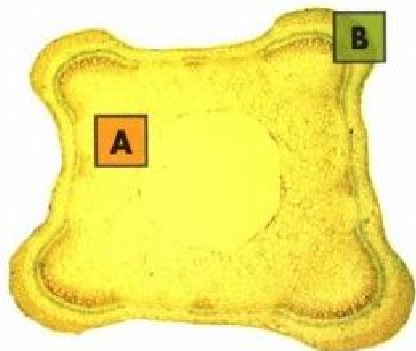


The dried aerial part of *Leonurus japonicus* Houtt. (Fam. Labiatae).
唇形科植物益母草的干燥地上部分。

Sketch of transverse section of stem
茎横切面简图



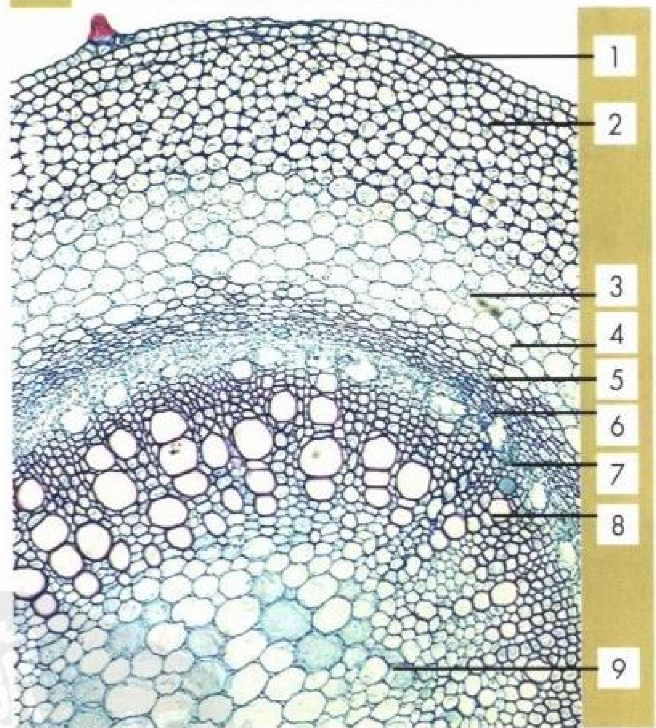
Transverse section of stem
茎横切面组织图



A Parenchymatous cells containing fine raphides and small prisms of calcium oxalate
薄壁细胞含有细小草酸钙针晶"↗"和小方晶"↗"



B Transverse section of stem (part of arris)
茎横切面组织图(棱角部分)



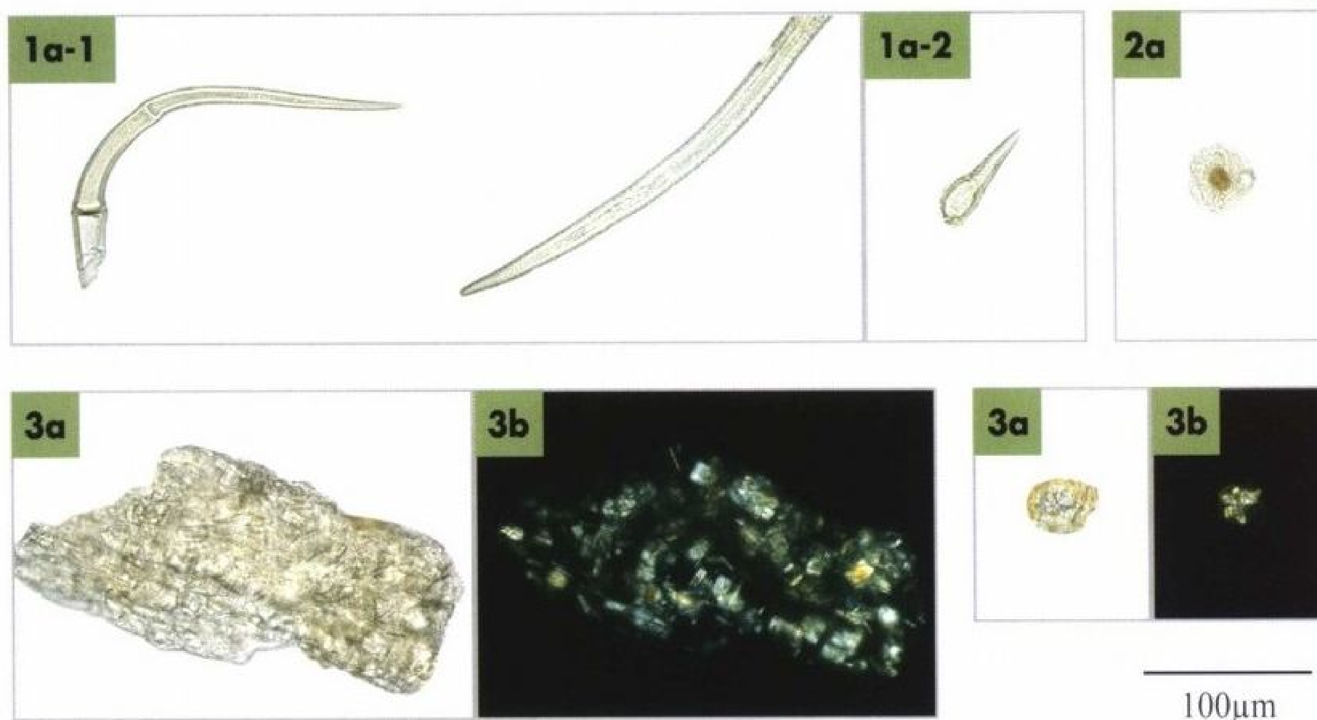
Transverse section of stem

1. Epidermis	With cuticles and trichomes. Glandular scales with a 4, 6, or 8-, celled head and a unicellular stalk, non-glandular hairs 1~4 cells.
2. Hypodermal collenchyma	Abundant in the angular region.
3. Cortex	Consisting of several rows of parenchymatous cells.
4. Endodermis	Distinct.
5. Pericyclic fibre bundles	Slightly lignified.
6. Phloem	Relatively narrow.
7. Cambium	Indistinct.
8. Xylem	Developed in the angular region.
9. Parenchyma pith	Cells relatively large.
Parenchymatous cells	Containing fine raphides and small prisms of calcium oxalate; cortical parenchymatous cells near epidermal part of fresh caudex containing chloroplasts.

茎横切面组织图注

1. 表皮	外被角质层，有毛茸；腺鳞头部4、6或8细胞，柄单细胞；非腺毛1~4细胞。
2. 下皮厚角组织	在棱角处较多。
3. 皮层	为数列薄壁细胞。
4. 内皮层	明显。
5. 中柱鞘纤维束	微木化。
6. 韧皮部	较窄。
7. 形成层	不明显。
8. 木质部	在棱角处较发达。
9. 髓部薄壁组织	细胞较大。
薄壁细胞	含细小草酸钙针晶及小方晶。鲜品近表皮部分皮层薄壁细胞含叶绿体。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Non-glanular hairs	Easily visible. Non-glanular hairs of stem and leaves (1a-1): 1~4 cells, slightly curved; apical cell relatively long; with thick walls and fine warty protuberance on the surface; spiral cuticle textures occasionally visible. Non-glanular hairs of bracts (1a-2): unicellular and pyramid; straight or slightly crooked.
2. Grandular scales	4 or 8-celled head; subrounded or elliptical on the top view; stalk very short.
3. Crystals of calcium oxalate	Scattered or present in mesophyll cells. Raphides extremely fine and clusters with relatively sharp angles; prisms square, rectangular or rhombus. Brightly yellowish-white or orange in color observed under a polarizing microscope.

图注

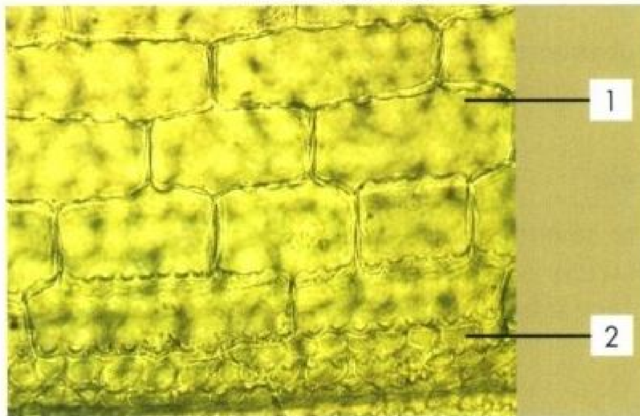
1. 非腺毛	易见，茎叶非腺毛(1a-1)：1~4个细胞，稍弯曲，顶端细胞较长，壁厚，表面有细小疣状突起，有的可见螺状角质纹理。苞片非腺毛(1a-2)：单细胞，角锥形，平直或稍弯曲。
2. 腺鳞	头部4或8个细胞，顶面观类圆形或椭圆形，柄极短。
3. 草酸钙结晶	散在或存于叶肉细胞。针晶极细小；簇晶棱角较尖；方晶呈方形、长方形或菱形。偏光显微镜下结晶呈亮黄白色或橙黄色。

淡竹叶 Danzhuye

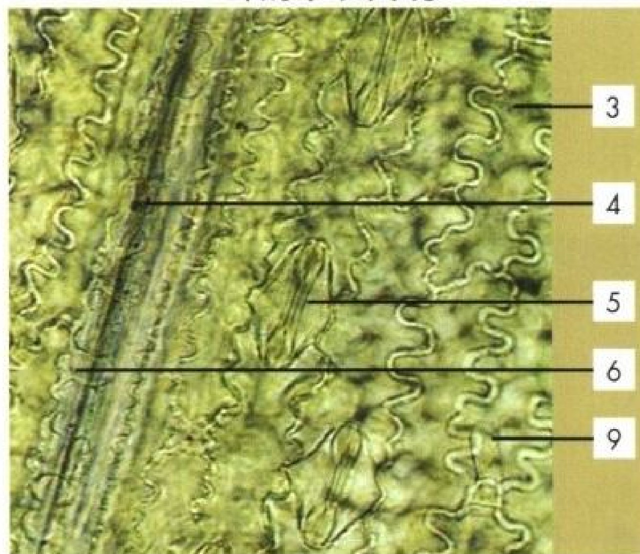


The dried stem and leaf of *Lophatherum gracile* Brongn. (Fam. Graninae).
禾本科植物淡竹叶的干燥茎叶。

Upper surface view of leaf
叶的上表面观



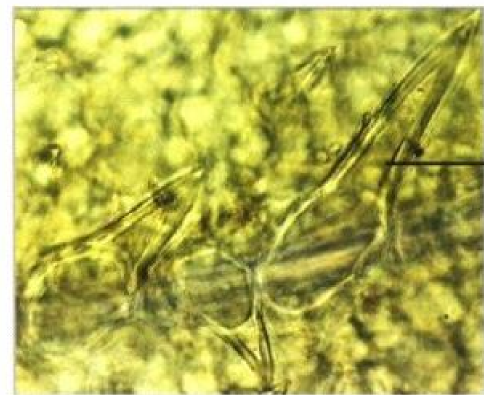
Lower surface view of leaf
叶的下表面观



A Long glandular hairs
长非腺毛



B Short glandular hairs
短非腺毛





Surface view of leaf

1. Upper epidermis	Cells rectangular or subsquare, slightly anticlinal walls thin and undulately curved; round palisade tissue present under the upper epidermis.
2. Palisade tissue	1 row of cylindrical cells.
3. Lower epidermis and short cells	Arranged alternately or several ones connected together; long-cells rectangular, anticlinal walls sinuous; short-cells are dumbbell-shaped silica cells and subsquare suberized cells.
4. Silica cells	Dumbbell- shaped.
5. Stoma	Numerous, guard cells dumbbell-shaped, subsidiary cells nearly round-triangular.
6. Suberized cells	Subsquare.
7. Long non-glandular hairs	Unicellular, about 300μm in length.
8. Short non-glandular hairs	Unicellular, short- coniform, about 100μm in length.
9. Short and small trichoma of double cells	Occasionally visible.

叶表面观图注

1. 上表皮	细胞长方形或类方形，垂周壁薄，微波状弯曲，其下可见圆形栅栏组织。
2. 栅栏组织	1列圆柱形细胞。
3. 下表皮与短细胞	交替排列或数个相连，长细胞长方形，垂周壁波状弯曲；短细胞为哑铃形的硅质细胞和类方形的栓质细胞。
4. 硅质细胞	哑铃形。
5. 气孔	较多，保卫细胞哑铃形，副卫细胞近圆三角形。
6. 栓质细胞	类方形。
7. 长非腺毛	单细胞，长约300μm。
8. 短非腺毛	单细胞，呈短圆锥形，长约100μm。
9. 双细胞短小毛茸	偶见。

Main Powder Characteristics
主要粉末显微特征











100μm

Notes

1. Upper epidermis of leaf	Surface view: cells rectangular or subsquare; anticlinal walls thin and sinuately curved, observed round palisaded-cells under the upper epidermal cells.
2. Lower epidermis of leaf	Long cells and short cells arranged alternately or several ones connected; long-cells rectangular, anticlinal walls sinuately curved; short-cells is dumbbell-shaped silica cells, bunches of short cells in the vein.
3. Non-glandular hairs	Unicellular, mainly three types: slender non-glandular hairs (3a-1), with spiral striations, surrounding cells of base swelling; short coniform non-glandular hairs (3a-2).
4. Short and small trichoma	Rod-shape, double cells; apical cells slightly acerate and easily ablated.

图注

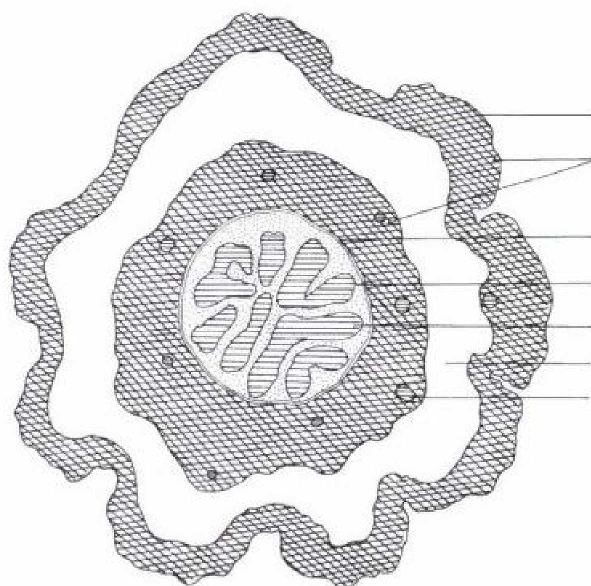
1. 叶上表皮	表面观细胞长方形或类方形，垂周壁薄，波状弯曲，其下可见圆形栅栏细胞。
2. 叶下表皮	长细胞与短细胞交替排列或数个相连，长细胞长方形，垂周壁波状弯曲；短细胞为哑铃形的硅质细胞，于叶脉处短细胞成串。
3. 非腺毛	单细胞，主要为三种：一种甚细长(3a-1)，有的具螺状纹理，基部周围细胞隆起；一种呈短圆锥状(3a-2)。
4. 短小毛茸	棒状，双细胞，顶端细胞略尖，易脱落。

伸筋草 Shenjincao

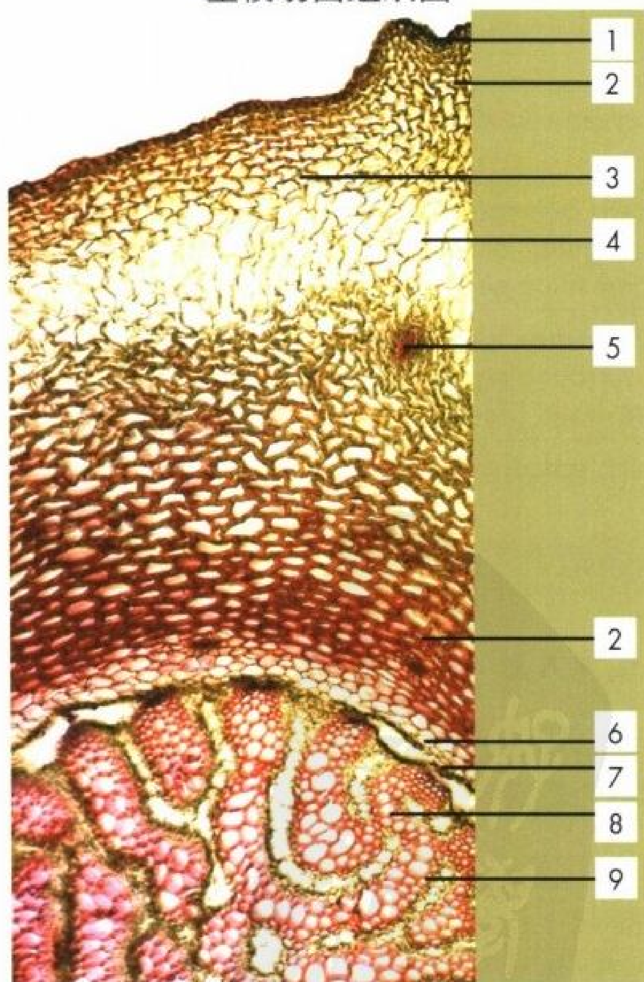


The dried herb of *Lycopodium japonicum* Thunb. (Fam. Lycopodiaceae).
石松科植物石松的干燥全草。

Sketch of transverse section of stem
茎横切面简图



Transverse section of stem
茎横切面组织图



Transverse section of stem	
1. Epidermis	1 row of cells.
2. Sclerenchymatous tissue	10~20 rows of cells.
3. Cortex	Broad, scattered with leaf-trace vascular bundles; with sclerenchymatous cells below epidermis and outside of stele, between them parenchymatous cells present.
4. Parenchyma	Consisting of 2~5 rows of cells, with slightly thickened walls.
5. Leaf-trace vascular bundles	Collateral vascular bundle.
6. Endodermis	Indistinct.
7. Pericycle	Parenchymatous cells, with plectostelein.
8. Xylem	Irregularly stripe-shaped or branched.
9. Phloem	Interlaced with xylem.

茎横切面组织图注	
1. 表皮	细胞1列。
2. 厚壁组织	10~20余列细胞。
3. 皮层	宽广，有叶迹维管束散在，表皮下方和中柱外侧均有厚壁细胞，其间有薄壁组织。
4. 薄壁组织	2~5列，细胞壁略增厚。
5. 叶迹维管束	外韧型。
6. 内皮层	不明显。
7. 中柱鞘	为薄壁细胞；内为编织中柱。
8. 木质部	呈不规则的带状或分枝状。
9. 韧皮部	交错于木质部中间。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermal cells of leaf	Subrectangular on the surface view; the anticlinal walls undulantly curved, about 2~3μm thick; stoma with 4~7 subsidiary cells.
2. Fibres	Long fusiform with top endings sharp usually broken; 20~50μm in diameter, 160~600μm long; some with pits.
3. Tracheids	Mainly spiral and scalariform vessels, 15~45μm in diameter.

图注

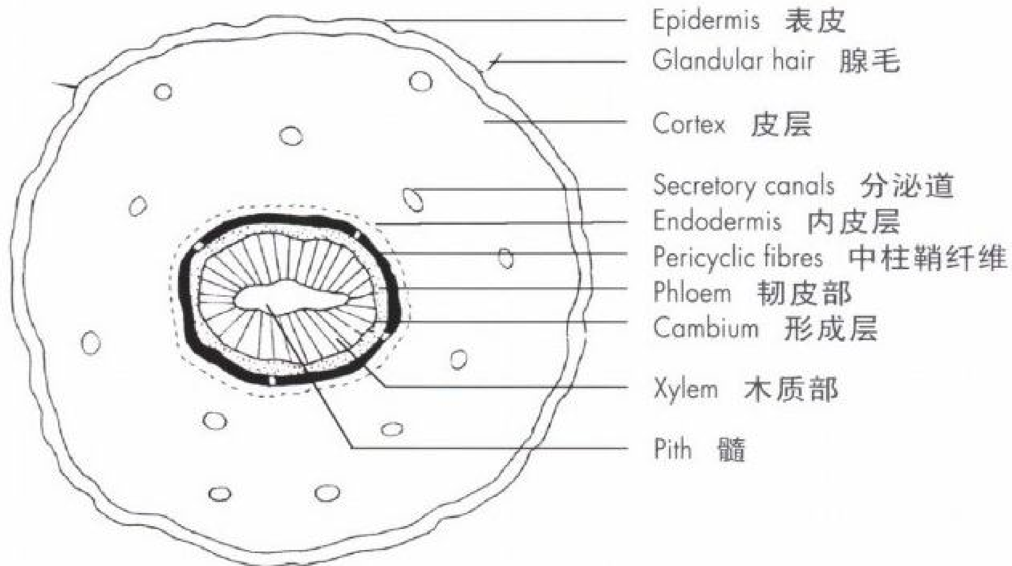
1. 叶的表皮细胞	表面观呈类长方形，垂周壁波状弯曲，壁厚2~3μm，可见气孔，副卫细胞4~7个。
2. 纤维	长梭形，顶端较尖常断裂，直径20~50μm，长160~600μm，有的可见纹孔。
3. 管胞	主为螺纹、梯纹，直径15~45μm。

金钱草 Jinqiancao

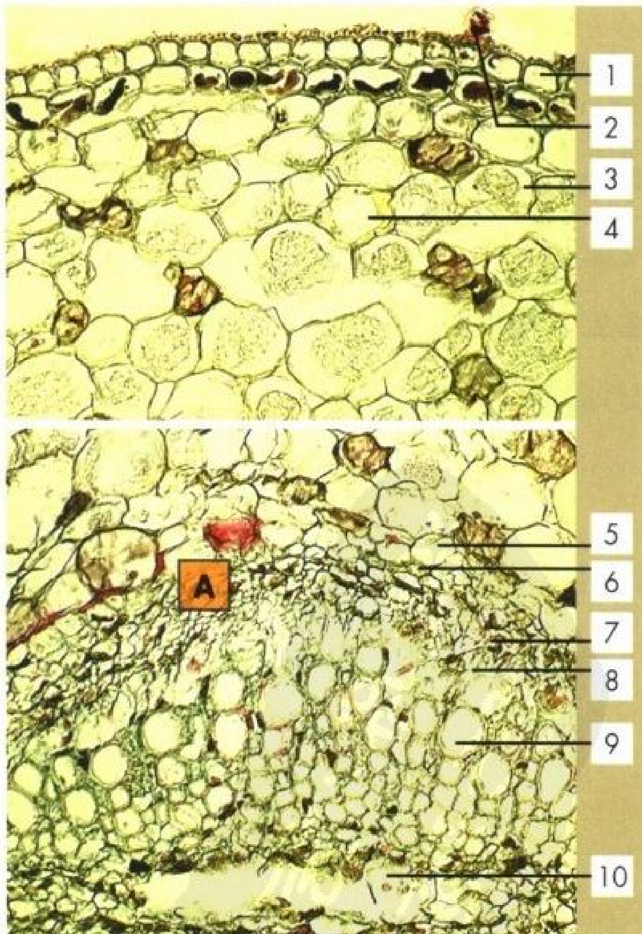


The dried herb of *Lysimachia christinae* Hance (Fam. Primulaceae).
报春花科植物过路黄的干燥全草。

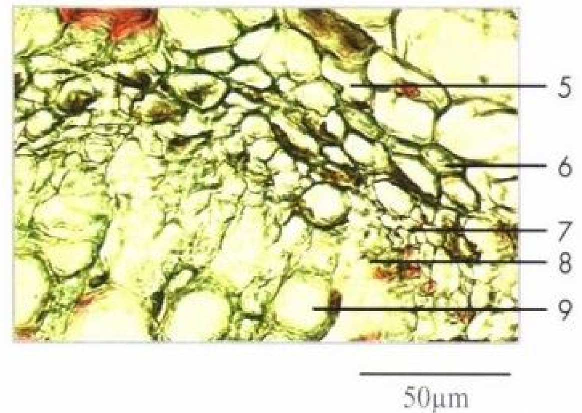
Sketch of transverse section of stem
茎横切面简图



Transverse section of stem
茎横切面组织图



A Partial stele
部分中柱



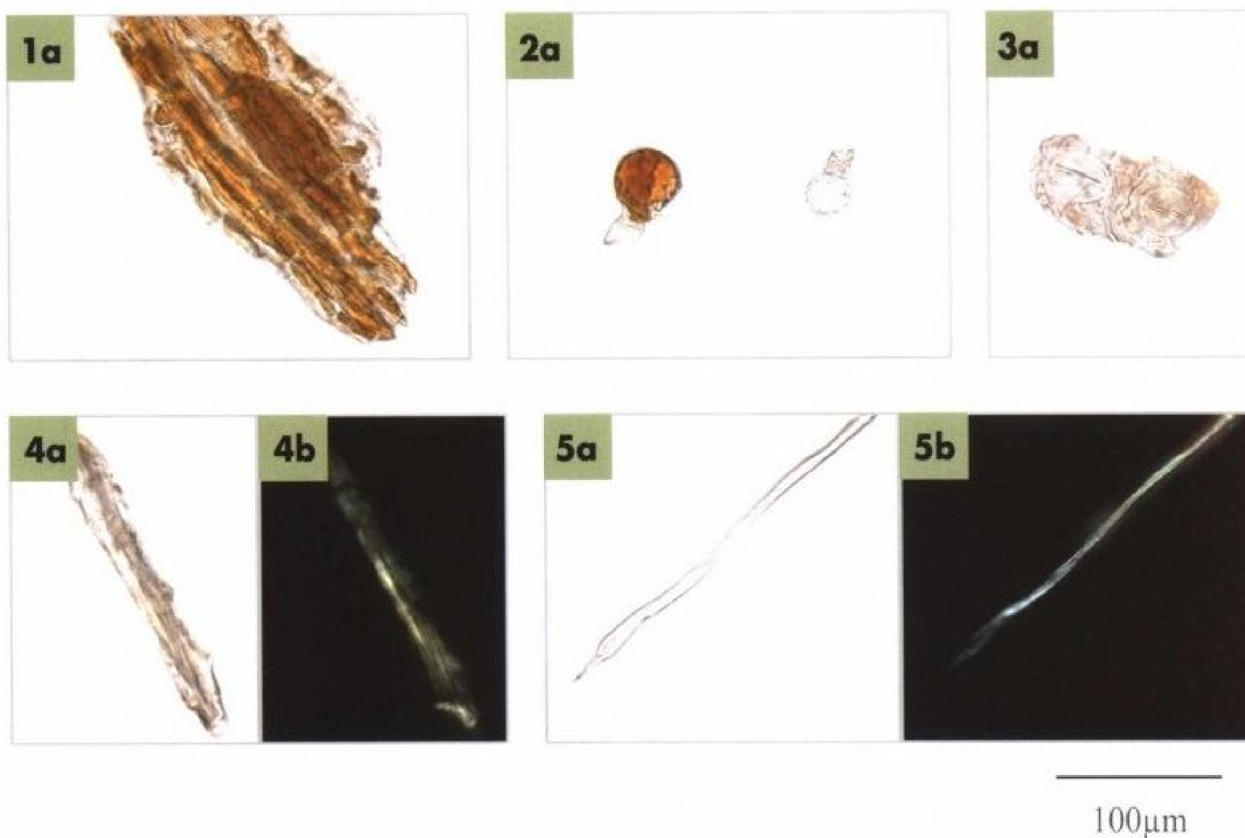
Transverse section of stem

1. Epidermal	Covered with cuticles; sometimes glandular hairs visible.
2. Glandular hairs	With a unicellular head and a stalk of 1~2 cells.
3. Cortex	Broad; some cells containing reddish-brown secretions.
4. Secretory canals	Scattered in cortex; surrounded by 5~10 secretory cells; inside of cells containing reddish-brown lumpy secretions.
5. Endodermis	Distinct.
6. Pericyclic fibres	Arranged in an interrupted ring; with slightly lignified walls.
7. Phloem	Narrow.
8. Cambium	Indistinct.
9. Xylem	Linked up in a ring.
10.Pith	Usually hollowed.

茎横切面组织图注

1. 表皮细胞	外被角质层，有时可见腺毛。
2. 腺毛	头部单细胞，柄1~2细胞。
3. 皮层	宽广，细胞中有的含红棕色分泌物。
4. 分泌道	散生于皮层，周围分泌细胞5~10个，内含红棕色块状分泌物。
5. 内皮层	明显。
6. 中柱鞘纤维	断续排列成环，壁微木化。
7. 韧皮部	狭窄。
8. 形成层	不明显。
9. 木质部	连接成环。
10. 髓	常成空腔。 薄壁细胞含淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Reddish-brown masses	Numerous; subrounded or irregularly lumpish; consisting in parenchymatous cells.
2. Glandular hairs	Head unicellular and subrounded; with unicellular and short stalk. Radial striations observed in the epidermis where glandular hairs inserted.
3. Stoma	In the lower epidermis; anomocytic; with 4~5 subsidiary cells.
4. Fibres	Strip-shaped; walls thick and pit canals distinct.
5. Non-glandular hairs	3~5 celled; usually 1~2 cells shrinked at the top or middle and arranged alternately.

图注

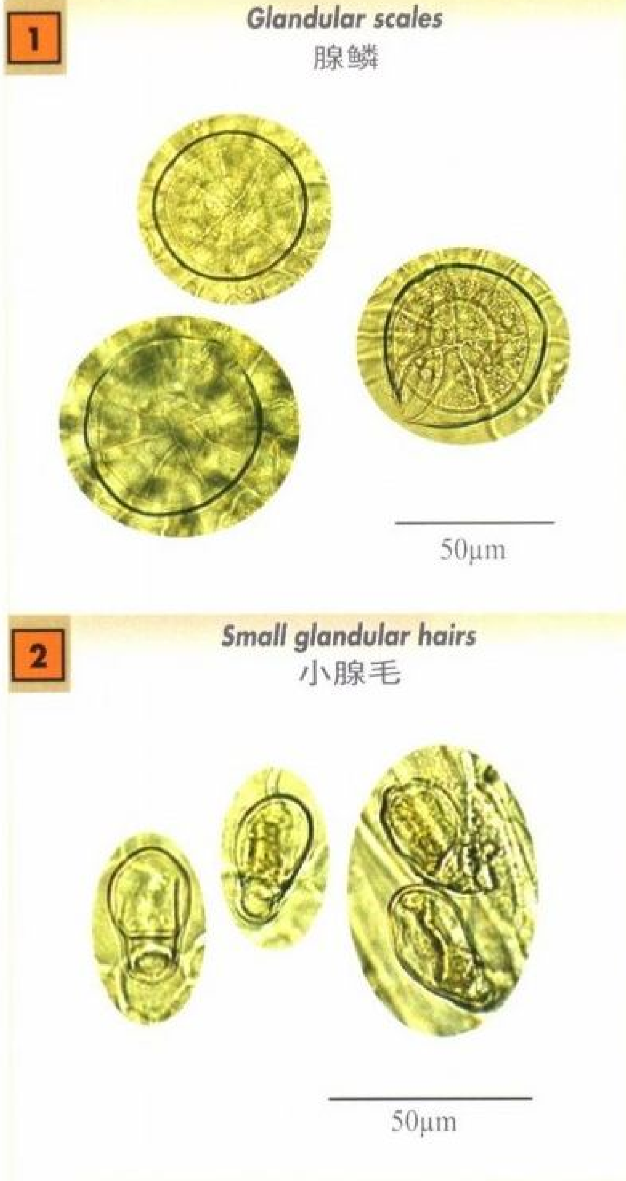
1. 红棕色块状物	众多，呈类圆形或不规则团块，存在于薄壁细胞中。
2. 腺毛	头部单细胞，类圆形，柄部单细胞，短小。腺毛着生处的表皮可见放射状纹理。
3. 气孔	存在于下表皮中，不定式，副卫细胞4~5个。
4. 纤维	长条形，壁厚，孔沟明显。
5. 非腺毛	3~5个细胞，顶端及中部常有1~2个细胞缢缩，相间排列。

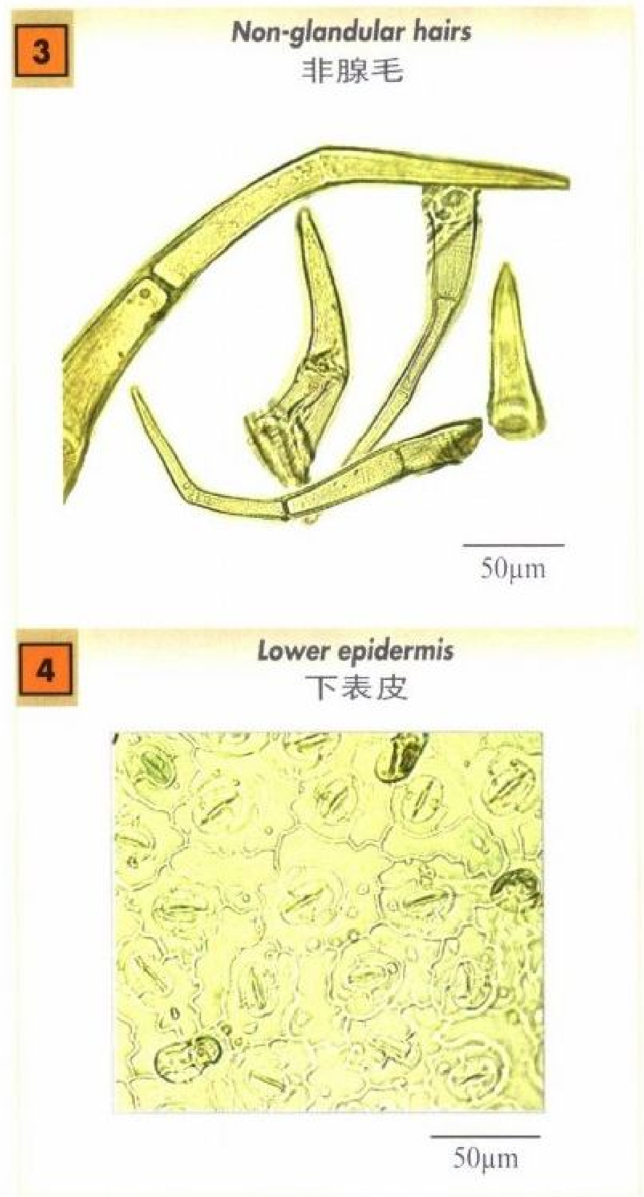


薄荷 Bohe

The dried aerial part of *Mentha haplocalyx* Briq. (Fam. Labiatae).

唇形科植物薄荷的干燥地上部分。





Surface view of leaf

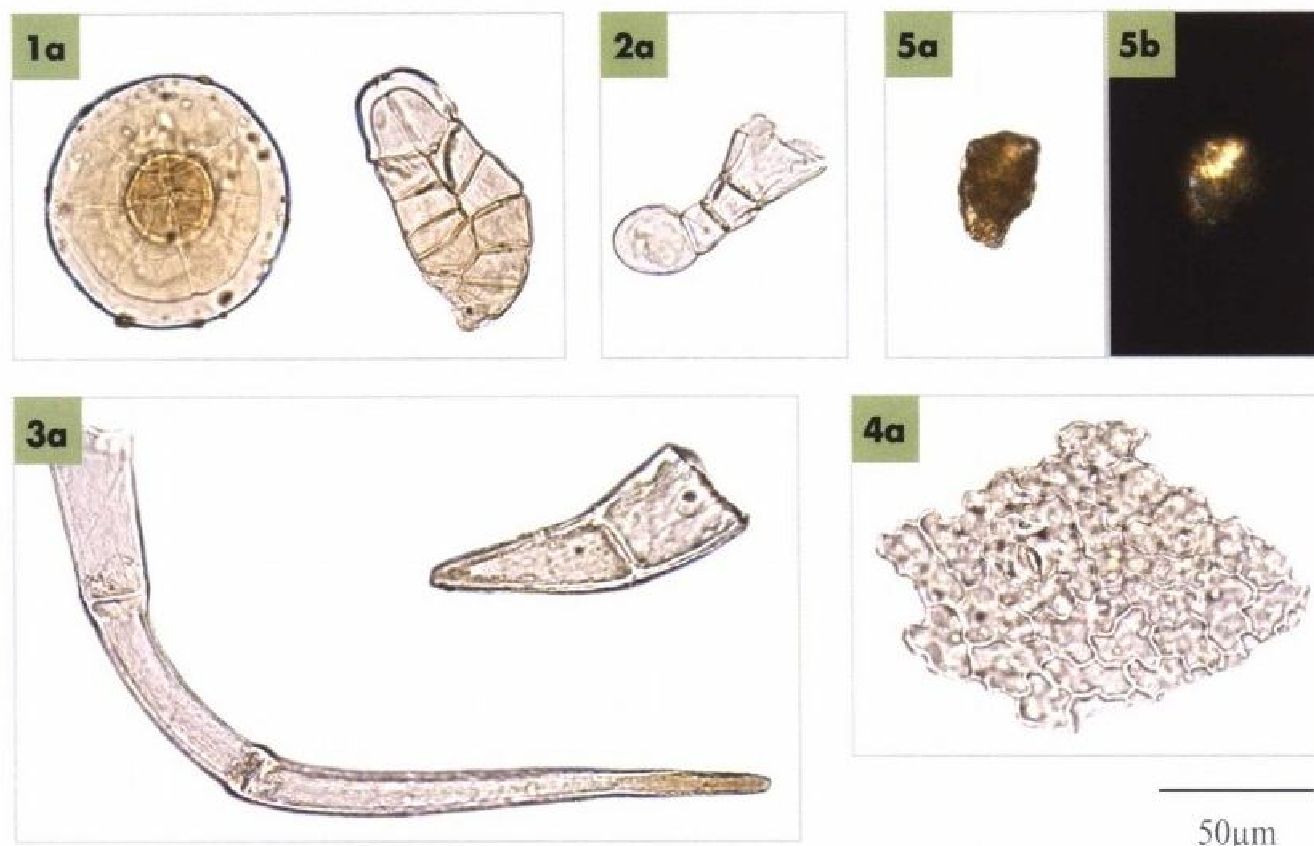
1. Glandular scales	8 cells in head; 90μm in diameter; stalk unicellular.
2. Small glandular hairs	Both of head and stalk unicellular.
3. Non-glandular hairs	1~8 cells; usually curved; with thickened and warty walls.
4. Lower epidermis	Stoma usually visible; diacytic type.

叶的表面观图注

1、腺鳞	头部8细胞，直径约至90μm，柄单细胞。
2、小腺毛	头部及柄部均为单细胞。
3、非腺毛	1~8细胞，常弯曲，壁厚，微具疣状突起。
4、下表皮	气孔多见，直轴式。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Glandular scale	8 cells in head; about 90μm in diameter; stalk unicellular.
2. Small glandular hair	Both of head and stalk unicellular.
3. Non-glandular hair	1~8 cells; usually curved; with thickened and warty walls. Bluish-green color observed under a polarizing microscope.
4. Epidermal cells	Cell walls slightly curved; stomata in diacytic type.
5. Crystals of hesperidin	Located in epidermal cells and parenchymatous cells of stem and leaf; pale yellow or pale brown; slightly in fan-shaped or irregular shaped; radial striations seen indistinctly. Brightly orange in color observed under a polarizing microscope.

图注

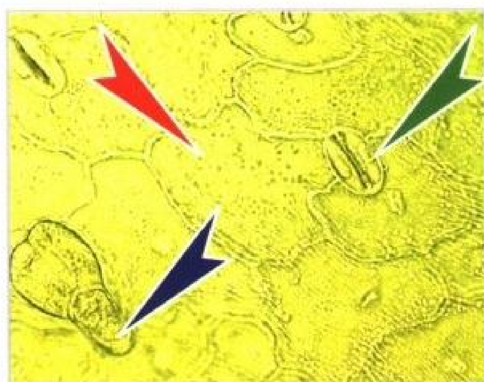
1. 腺鳞	头部8细胞，直径约至90μm；柄为单细胞。
2. 小腺毛	头部及柄部均为单细胞。
3. 非腺毛	1~8个细胞，常弯曲，壁厚，微具疣状突起。偏光显微镜下呈蓝绿色。
4. 表皮细胞	细胞壁略弯曲，气孔直轴式。
5. 橙皮苷结晶	存在于茎、叶表皮细胞及薄壁细胞中，淡黄色或淡棕色，略呈扇形或不规则形，隐约可见放射状纹理。偏光显微镜下结晶呈亮橙黄色。



车前草 Cheqiancao

The dried herb of *Plantago asiatica* L. (Fam. Plantaginaceae).
车前科植物车前的干燥全草。

1 ***Upper epidermal cells "↗", stoma "↗" and glandular hairs "↗"***
上表皮细胞"↗"、气孔"↗"与腺毛"↗"



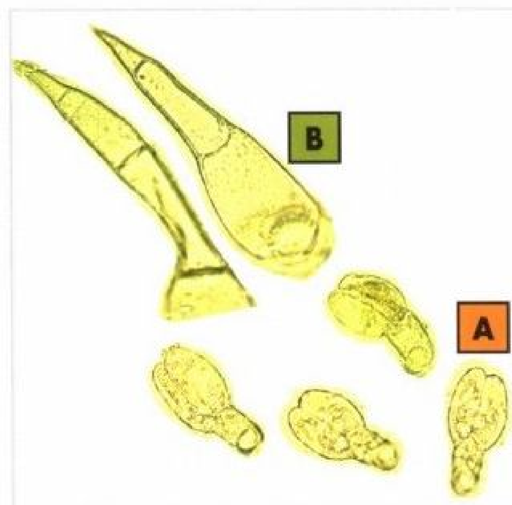
50μm

2 ***Lower epidermal cells "↗", stoma "↗" and glandular hairs "↗"***
下表皮细胞"↗"、气孔"↗"与腺毛"↗"



50μm

3 ***Glandular hairs (A) and non-glandular hairs (B)***
腺毛与非腺毛



50μm

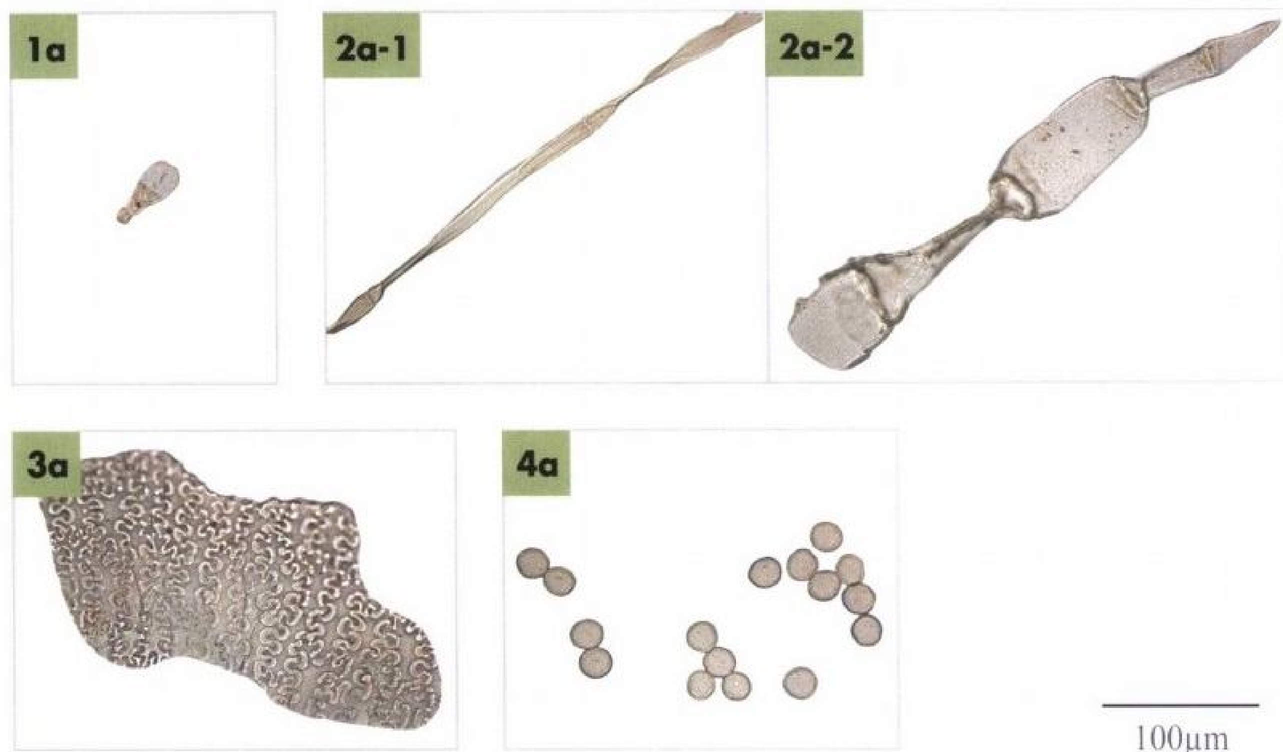
Surface view of leaf

1. Upper epidermal cells	Subrectangular, with cuticle striations.
2. Lower epidermal cells	Subrectangular, walls undulantly curved.
3. Stoma	Anomocytic type, with 3~4 subsidiary cells.
4. Glandular hairs	2 cells in the head, elliptical, with a unicellular stalk.
5. Non-glandular hairs	Rarely occurring, 2~5 cells, 100~320μm long, walls slightly thickened and with faint verruca.

叶的表面观图注

1. 上表皮细胞	类长方形，具角质纹理。
2. 下表皮细胞	类长方形，壁波状弯曲。
3. 气孔	不定式，副卫细胞3~4个。
4. 腺毛	头部2细胞，椭圆形，柄单细胞。
5. 非腺毛	少见，2~5细胞，长100~320μm，壁稍厚，微具疣状突起。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Glandular hairs	2 cells in the head; elliptical, with a unicellular stalk.
2. Non-glandular hairs	Abundant non-glandular hairs on the petiole and bract(2a-1): complete ones composed of dozens of cells; cells relatively slender; ususlly shrinked; walls with fine verruca. Non-glandular hairs of scape (2a-2): rare, 2~6 cells; apical cells short; some middle cells narrow; walls relatively thickened with dense verruca.
3. Pericarp cells	Pale yellow or colorless; irregular shape on the surface view; anticlinal walls deeply undulant; lignified, occasionally bead-like; pits sparse.
4. Pollen grains	Pale yellow or colorless, subrounded; with 5 germination apertures; warty sculptures on the surface.

图注

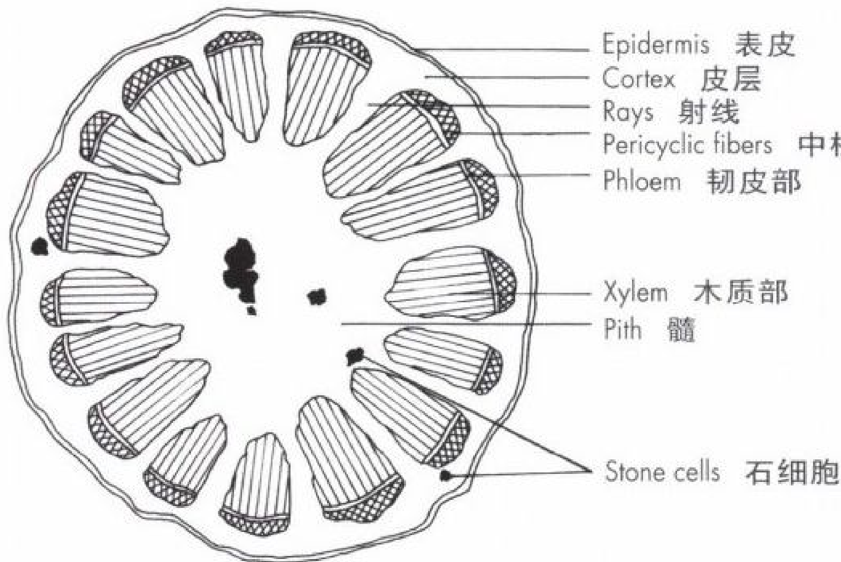
1.	腺毛	头部2细胞，椭圆形，柄单细胞。
2.	非腺毛	叶柄、苞片的非腺毛较多(2a-1)，完整者十数细胞，甚细长，常稍皱缩，壁有微小疣状突起。花葶的非腺毛较少(2a-2)，2~6细胞，顶端细胞常较短，有的中部细胞狭窄，壁稍厚，疣状突起较密。
3.	果皮细胞	淡黄色或无色，表面观呈不规则形，垂周壁深波状弯曲，木化，偶呈连珠状，纹孔稀疏。
4.	花粉粒	淡黄色或无色，类圆形，有5萌发孔，表面具疣状雕纹。



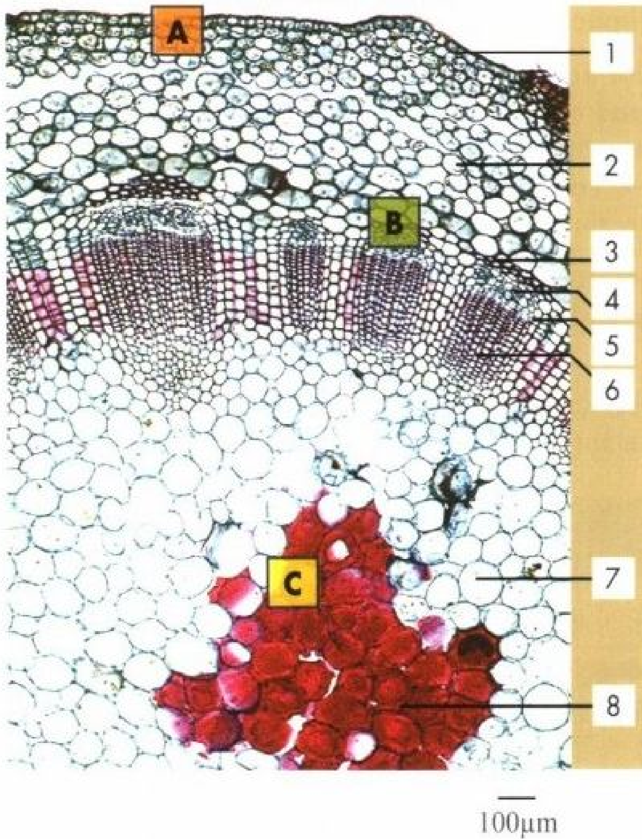
肿节风 Zhongjiefeng

The dried herb of *Sarcandra glabra* (Thunb.)Nakai (Fam. Chloranthaceae).
金粟兰科植物草珊瑚的干燥全草。

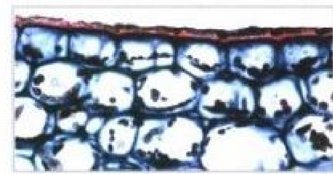
Sketch of transverse section of stem
茎横切面简图



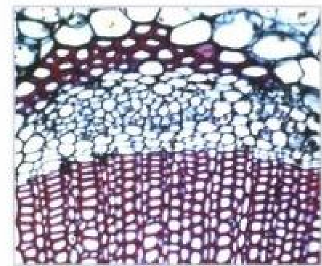
Transverse section of stem
茎横切面组织图



A Epidermal cells covered with cuticle
表皮细胞外被角质层



B Pericycle fibre and vascular bundle
中柱鞘纤维及维管束



C Stone cell groups in pith
髓部石细胞群



Transverse section of stem

1. Epidermal	Cells subsquare or long-rounded; covered with cuticle; the outer margins bluntly dentate.
2. Cortex	Cells more than 10 rows; showing 2~3 rows of collenchymatous cells at outer side; parenchymatous cells at inner side containing brownish-yellow pigment.
3. Pericycle fibre bundles	Lunate type; arranged in an interrupted ring; lignified.
4. Phloem	Narrow.
5. Cambium	Indistinct.
6. Xylem	Containing numerous tracheids; rays 2~8 rows of cells in width.
7. Pith	Parenchymatous cells larger; sometimes showing stone cells scattered; single or in groups.
8. Stone cell groups	Mostly distributed in pith.

茎横切面组织图注

1. 表皮	细胞类方形或长圆形，外被角质层，外缘呈钝齿状。
2. 皮层	细胞10余列，外侧为2～3列厚角细胞，内侧薄壁细胞内含棕黄色色素。
3. 中柱鞘纤维束	呈新月形，断续环列，木化。
4. 韧皮部	狭窄。
5. 形成层	不明显。
6. 木质部	管胞多数，射线宽2～8列细胞。
7. 髓部	薄壁细胞较大，有时可见石细胞单个或成群散在。
8. 石细胞群	主要分布于髓部。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermis	Cells irregular rectangular; elliptical or ovate in shape; anticlinal walls curved or somewhat straight; stomata slightly sunken; anomocytic or short paracytic type.
2. Fibres	Singly scattered or in bundles; long fusiform; slightly curved; walls relatively thin; lumina large; pit canals and pits clear.
3. Stone cells	Subrounded; subsquare or one end straight with the other tapering; walls thick; pit canals and pits clear. Brightly yellow observed under a polarizing microscope.
4. Oil cells	Round or subrounded; orange in color; containing yellow oil droplets or secretions.

图注

1. 表皮	细胞不规则长方形、椭圆形或卵圆形，垂周壁弯曲或稍平直；可见气孔稍下陷，不定式或短平列式。
2. 纤维	单个散在或成束，长梭形，稍弯曲，壁较薄，胞腔较大，孔沟和纹孔明显。
3. 石细胞	类圆形、类方形或一端平截另一端渐尖，壁厚，孔沟和纹孔明显。偏光显微镜下呈亮黄色。
4. 油细胞	圆形或类圆形，橙黄色，内有黄色油滴或分泌物。

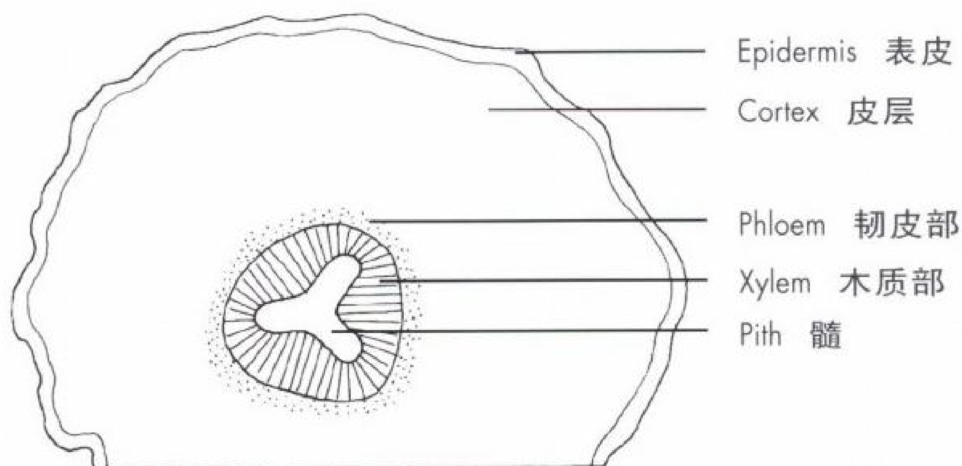
垂盆草 Chuipencao



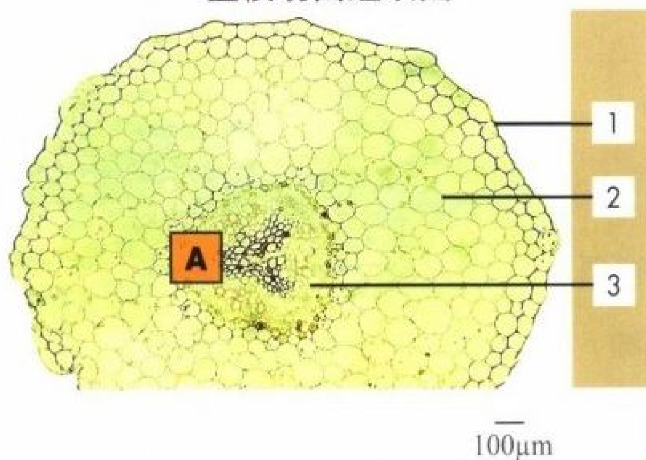
The fresh or dried herb of *Sedum sarmentosum* Bunge (Fam. Crassulaceae).

景天科植物垂盆草的新鲜或干燥全草。

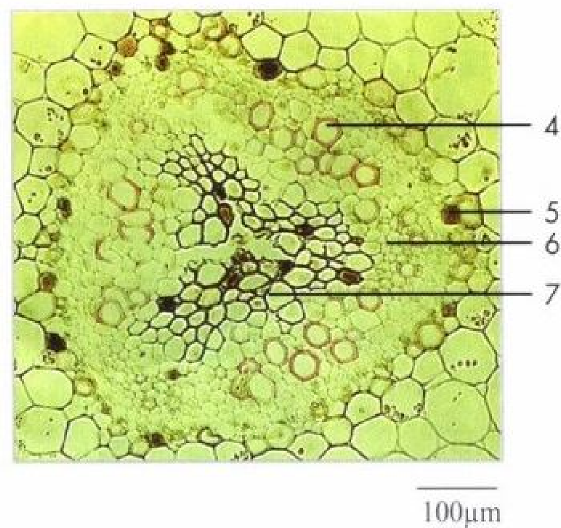
Sketch of transverse section of stem
茎横切面简图



Transverse section of stem
茎横切面组织图



A Stele
中柱



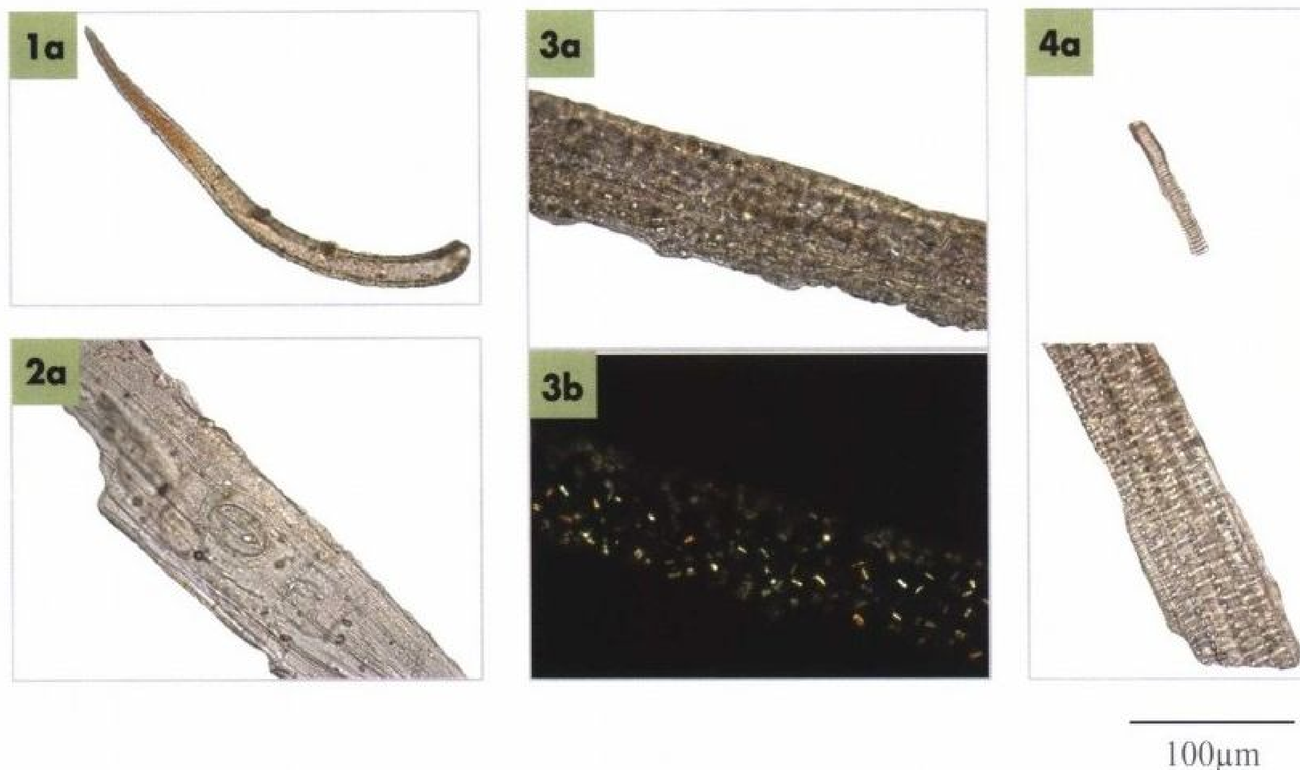
Transverse section of stem

1. Epidermis	Cells rectangular, with thickened walls.
2. Cortex	Consisting of over 10 rows of parenchymatous cells.
3. Stele	Small, vascular bundles collateral type.
4. Xylem	Vessels subrounded.
5. Reddish-brown secretion	Present in pith cells and cells close to phloem.
6. Phloem	Outside xylem, arranged in a ring.
7. Pith	Triangular, cells polygonal with very thick and non-lignified walls.

茎横切面组织图注

1. 表皮	细胞长方形，外壁增厚。
2. 皮层	约有10余列薄壁细胞。
3. 中柱	小，维管束外韧型。
4. 木质部	导管类圆形。
5. 红棕色分泌物	存在于紧靠韧皮部细胞及髓部细胞中。
6. 韧皮部	位于木质部外侧，排列成环。
7. 髓部	呈三角状，细胞多角形，壁甚厚，非木化。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Non-glandular hairs	Mostly broken; unicellular and curved. Dense verrucae on the surface; lumina containing reddish-brown contents.
2. Epidermis	Anticlinal walls of upper and lower epidermis slightly undulately curved; stomata anisocytic type.
3. Prisms of calcium oxalate	Numerous; fine and short rod-shaped in shape; existing in parenchymatous cells. Brightly white or orange under a polarizing microscope.
4. Vessels	Mainly spiral and annular vessels.

图注

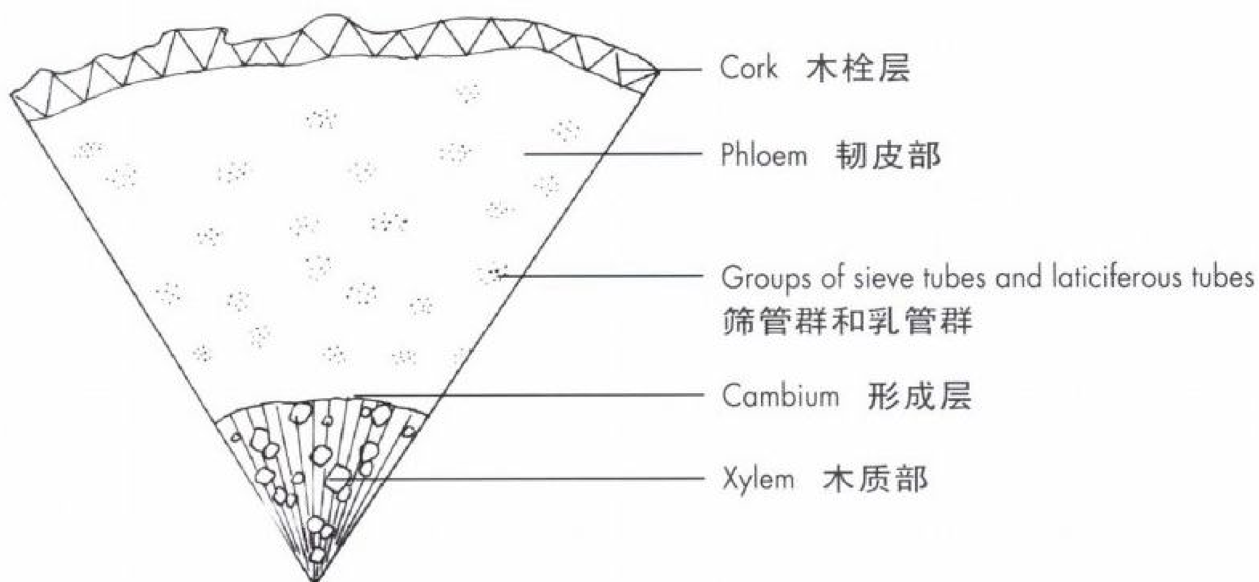
1. 非腺毛	多碎断，单细胞，弯曲。表面有较细密疣状突起，胞腔内有红棕色物。
2. 表皮	上下表皮细胞垂周壁均微波状弯曲，气孔不等式。
3. 草酸钙方晶	较多，细小，短棒状，存在于薄壁细胞中。偏光下亮白色或橙黄色。
4. 导管	多为螺纹或环纹导管。

蒲公英 Pugongying

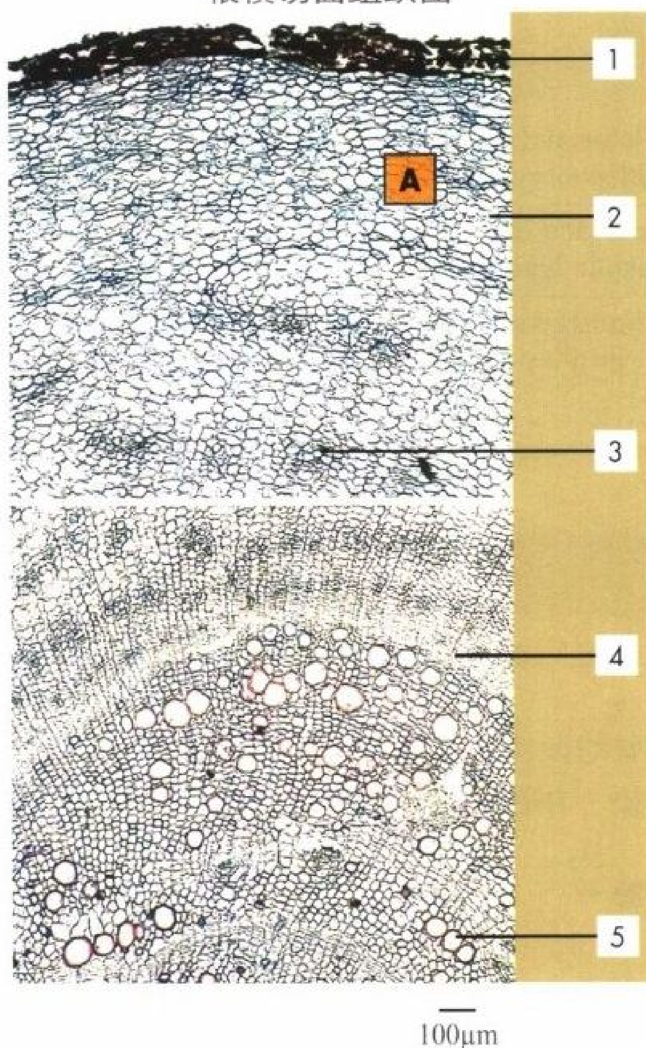


The dried herb of *Taraxacum mongolicum* Hand.-Mazz. (Fam. Compositae).
菊科植物蒲公英的干燥全草。

Sketch of transverse section of root
根横切面简图

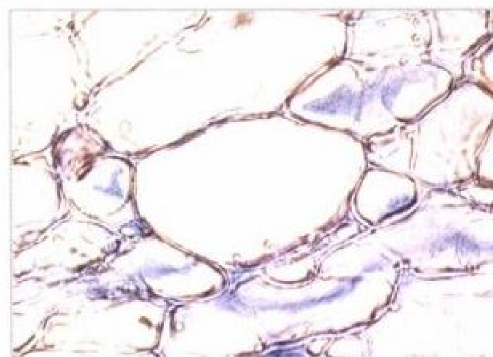


Transverse section of root
根横切面组织图



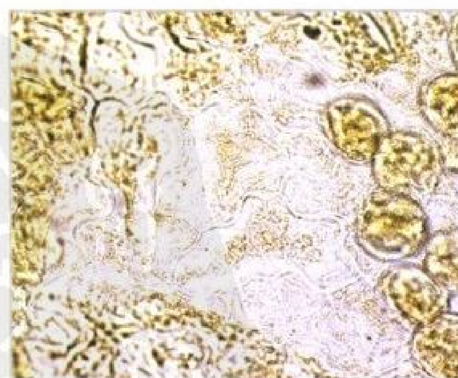
100μm

A *Groups of laticiferous tubes*
乳管群



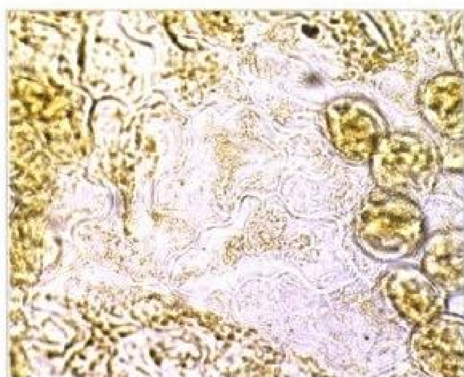
50μm

The upper epidermal cells
上表皮细胞

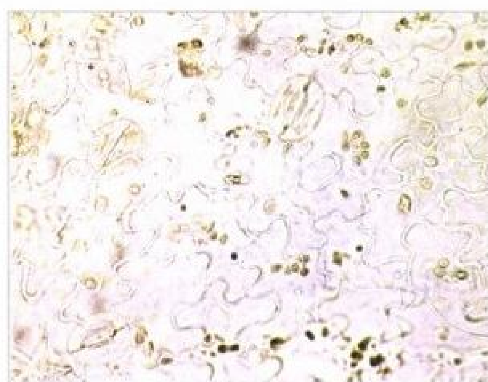


50μm

1 *The upper epidermal cells*
上表皮细胞



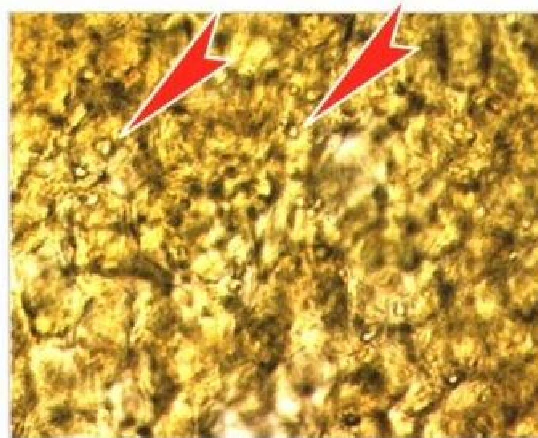
2 *The lower epidermal cells*
下表皮细胞



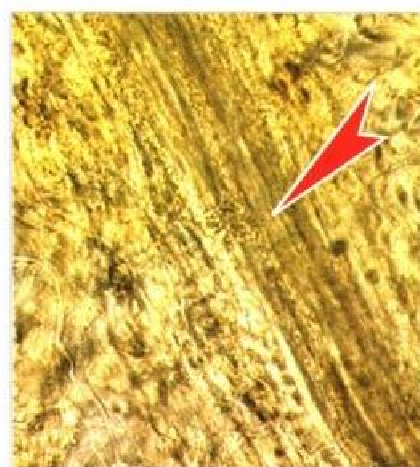
3 *Non-glandular hairs*
非腺毛



4 *Parenchymatous cells containing fine crystals of calcium oxalate*
薄壁细胞含有细小草酸钙晶体



5 *Laticiferous tubes*
乳汁管



Transverse section of root

1. Cork	Several rows of cells; brown.
2. Phloem	Broad.
3. Groups of laticiferous tubes	Arranged in several interrupted whorls in phloem.
4. Cambium	In a ring.
5. Xylem	Relatively small; rays indistinct; vessels relatively large and scattered.
Parenchymatous cells	Containing inulin.

Surface view of leaf

1. The upper epidermal cells	Anticlinal walls sinuously curved; cuticle striations of surface distinct or sparsely visible.
2. Non-glandular hairs	Located in both upper and lower epidermis; 3~9 celled; 17~34μm in diameter; apical cells extremely long; crumpled to whip-shape or fallen off.
3. The lower epidermal cells	Anticlinal walls sinuously curved; cuticle striations of surface distinct or sparsely visible; abundant stomata with 3~6 subsidiary cells; anomocytic or anisocytic.
4. Mesophellous cells	Containing fine crystals of calcium oxalate.
5. Laticiferous tubes	Scattered.

根横切面组织图注

1. 木栓层	细胞数列，棕色。
2. 韧皮部	宽广。
3. 乳管群	在韧皮部断续排列成数轮。
4. 形成层	成环。
5. 木质部	较小，射线不明显；导管较大，散列。
薄壁细胞	含菊糖。

叶表面观图注

1. 上表皮细胞	垂周壁波状弯曲，表面角质纹理明显或稀疏可见。
2. 非腺毛	上下表皮均有，3～9细胞，直径17～34μm，顶端细胞甚长，皱缩呈鞭状或脱落。
3. 下表皮细胞	垂周壁波状弯曲，表面角质纹理明显或稀疏可见；气孔较多，不定式或不等式，副卫细胞3~6个。
4. 叶肉细胞	含细小草酸钙结晶。
5. 乳汁管	散在。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermal cells	Anticlinal walls undulantly curved; cuticle striations on the surface distinct or scarce. Stomata anomocytic or anisocytic; with 3~8 subsidiary cells.
2. Non-glandular hairs	3~9 cells; 17~34μm in diameter.
3. Crystals of calcium oxalate	Sandy crystals fine; located in mesophyll tissue. Brightly yellowish-white in color observed under a polarizing microscope.
4. Laticiferous tubes	Branched, containing light yellow secretion.

图注

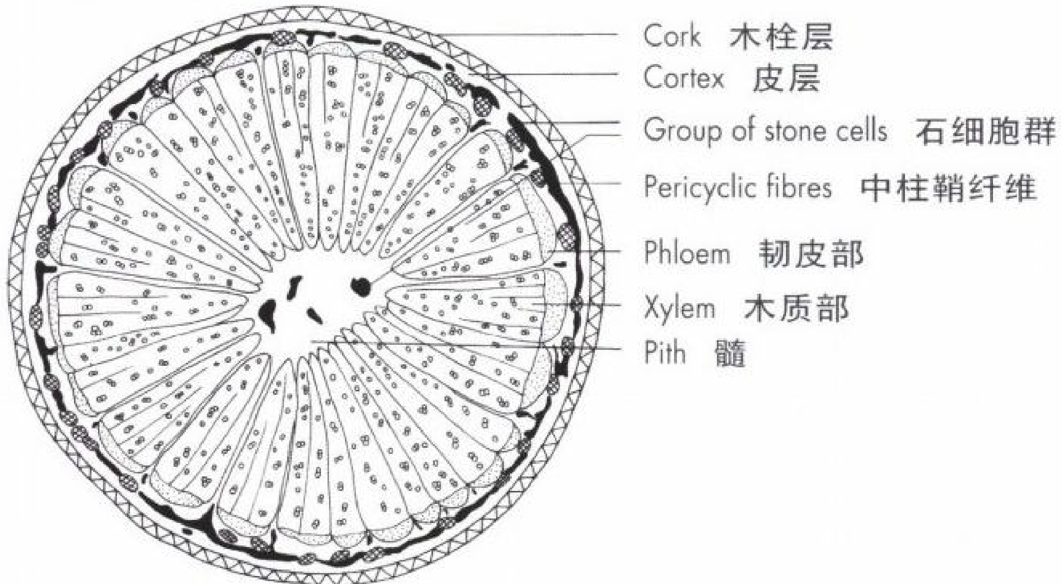
1. 表皮细胞	垂周壁波状弯曲，表面角质纹理明显或稀疏可见。气孔为不定式或不等式，副卫细胞3~6个。
2. 非腺毛	3~9个细胞，直径17~34μm。
3. 草酸钙结晶	砂晶细小，存在于叶肉组织中。偏光显微镜下呈亮黄白色。
4. 乳汁管	分枝状，内含淡黄色分泌物。



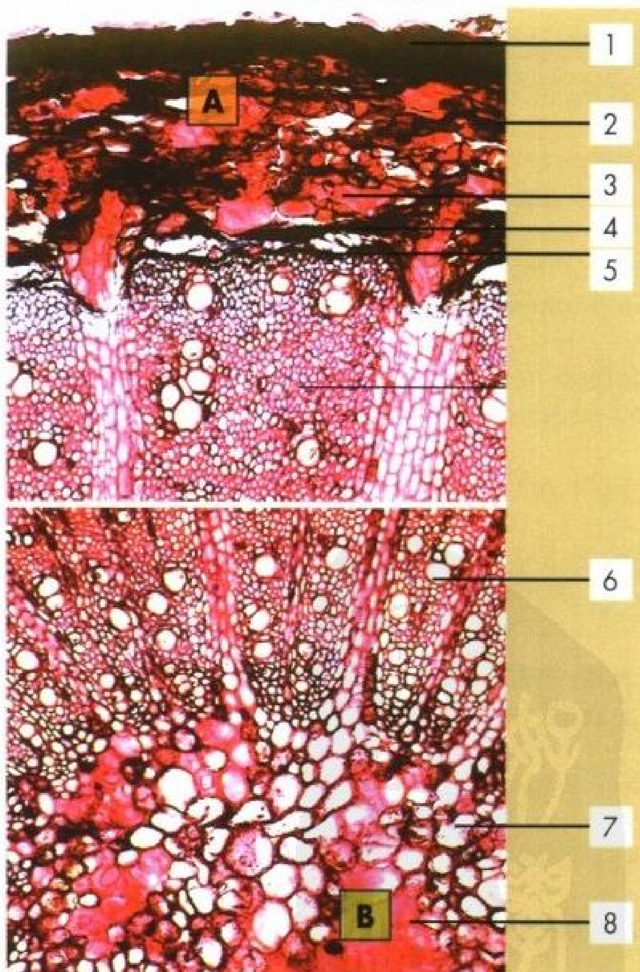
桑寄生 Sangjisheng

The dried leaf-bearing twig of *Taxillus chinensis* (DC.) Danser (Fam. Loranthaceae).
桑寄生科植物桑寄生的干燥带叶茎枝。

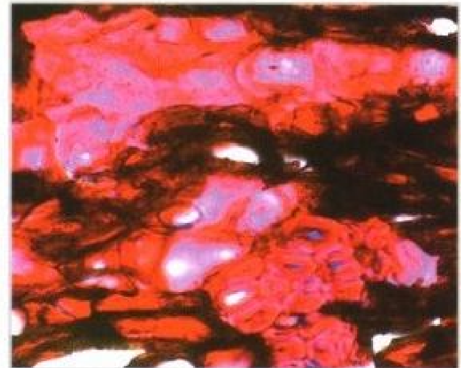
Sketch of transverse section of stem 茎横切面简图



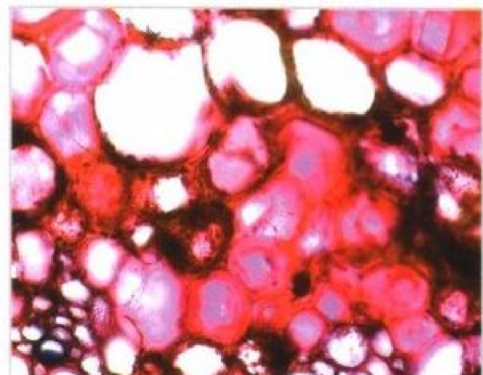
Transverse section of stem
茎横切面组织图



A Cortex
皮层



B Pith
髓



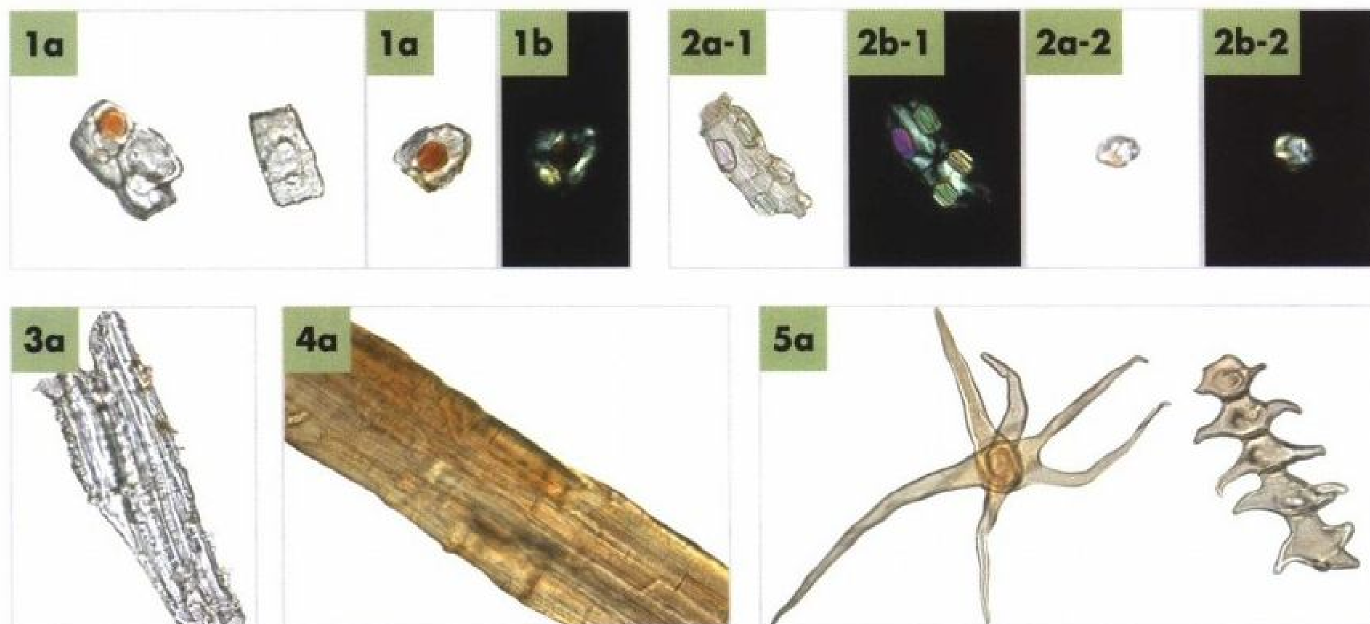
Transverse section of stem

1. Cork	Consisting of more than 10 rows of cells; some containing brown contents.
2. Cortex	Narrow, older stems containing stone cells groups; parenchymatous cells containing brown contents.
3. Stone cells and fibre bundles	Existing in pericycle; arranged in an interrupted ring.
4. Phloem	Extremely narrow; rays scattered with stone cells.
5. Cambium	Fasicular cambium distinct.
6. Xylem	Rays 1~4 rows of cells wide; stone cells also occurring near the pith; vessels scattered singly or 2~3 aggregated in groups.
7. Pith	With groups of stone cells; parenchymatous cells containing brown contents.
8. Groups of stone cells	Some containing prisms of calcium oxalate or brown contents.

茎横切面组织图注

1. 木栓层	为10余列细胞，有的含棕色物。
2. 皮层	窄，老茎有石细胞群，薄壁细胞含棕色物。
3. 石细胞及纤维束	存在于中柱鞘部位，断续环列。
4. 韧皮部	甚窄，射线散有石细胞。
5. 形成层	束内明显。
6. 木质部	射线宽1~4列细胞，近髓部也可见石细胞；导管单个散列或2~3个相聚。
7. 髓部	有石细胞群，薄壁细胞含棕色物。
8. 石细胞群	有的含草酸钙方晶或棕色物。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells	Singly scattered or several grouped; pale yellow or nearly colorless; subsquare or subrounded; walls of cells mostly three-side thickened, striation distinct. Some lumina containing prisms of calcium oxalate or brown masses. Brightly orange color observed under a polarizing microscope.
2. Crystals of calcium oxalate	Mostly prisms (2a-1), scattered or consisted in cells. Clusters (2a-2): small, with short and obtuse angles. Prisms appearing in polychrome and clusters appearing in brightly yellowish-white in color under a polarizing microscope.
3. Xylem fibres	Mostly in bundles; relative long; with relatively thin walls; pits scarce.
4. Pericyclic fibres	Mostly in bundles; slender, with extremely thickened walls; lumina linear or of ditch-shaped.
5. Stellate hairs	Pale yellow or yellowish-brown; singly scattered or overlapped; trifurcately or tetrafurcately branched; branches mostly curved; ends tapering; with walls relatively thickened. Brightly orange color observed under a polarizing microscope.

图注

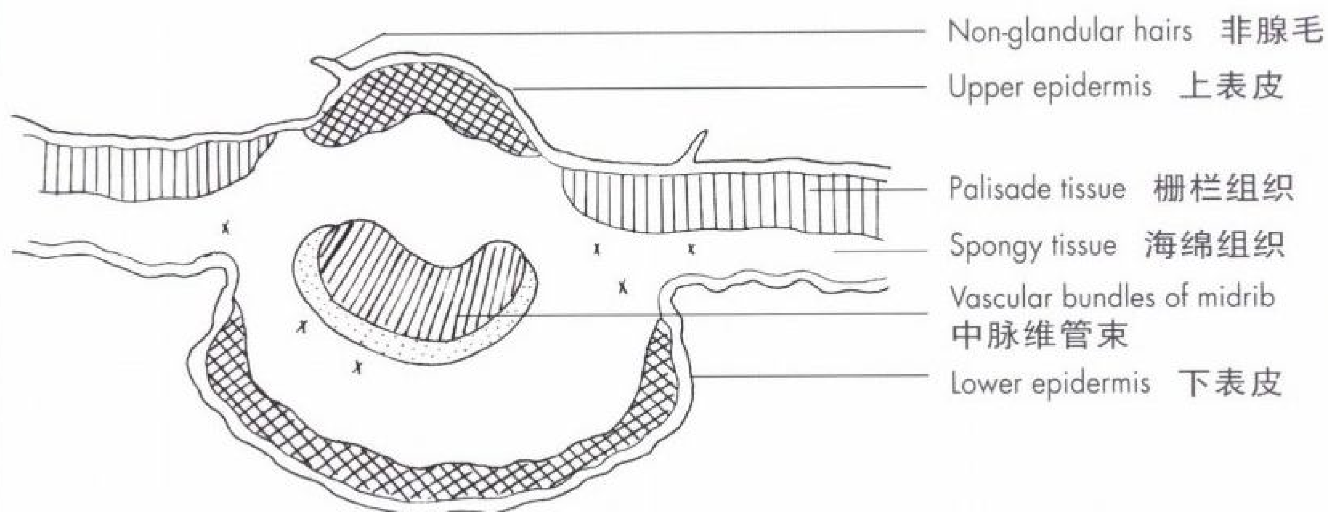
1. 石细胞	单个或数个成群，淡黄色或近无色，呈类方形、类圆形，细胞壁多三面增厚，层纹清晰，有的胞腔内含草酸钙方晶或棕色物。偏光显微镜下石细胞呈亮橙黄色。
2. 草酸钙结晶	多为方晶(2a-1)，散在或存在于细胞中；簇晶(2a-2)较小，棱角多短钝。偏光显微镜下方晶呈多彩状，簇晶呈亮黄白色。
3. 木纤维	多成束，较长，壁较薄，孔沟稀疏。
4. 中柱鞘纤维	多成束，细长，壁极厚，胞腔线形或沟纹状。
5. 星状毛	淡黄色或黄棕色，单一或叠生，3~4出分枝，分枝多弯曲，末端渐尖，壁稍厚。偏光显微镜下星状毛呈亮橙黄色。



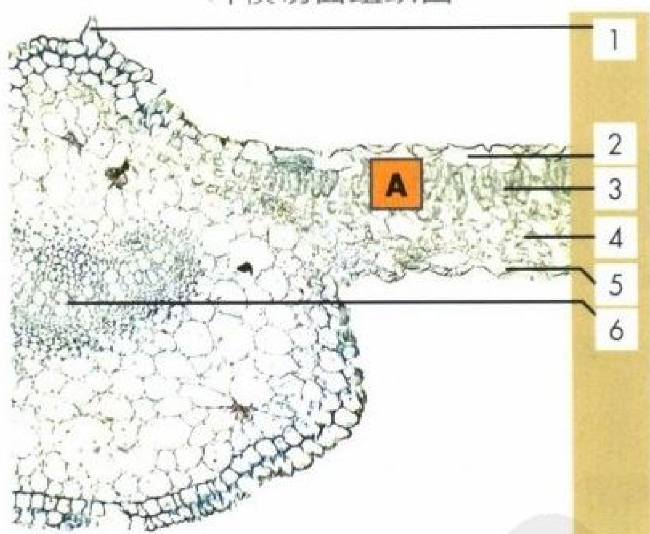
紫花地丁 Zihuadiding

The dried herb of *Viola yedoensis* Makino (Fam. Violaceae).
堇菜科植物紫花地丁的干燥全草。

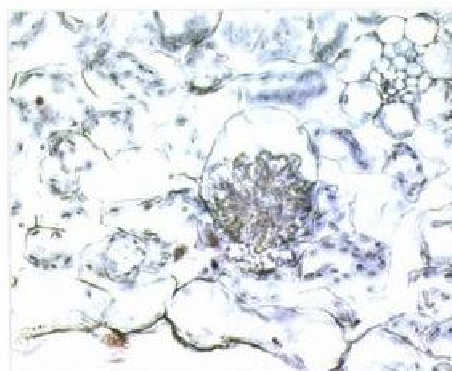
Sketch of transverse section of leaf
叶横切面简图



Transverse section of leaf
叶横切面组织图



A *Parenchymatous cells containing clusters of calcium oxalate*
薄壁细胞含草酸钙簇晶



Transverse section of leaf

1. Non-glandular hairs	Unicellular, 32~240μm long; 24~32μm in diameter; with short cuticle striations.
2. Upper epidermal cells	Relatively large; tangentially elongated; the outer walls thickened and the inner walls mucilaginous; frequently swollen into semi-circle.
3. Palisade tissue	2~3 rows of cells.
4. Spongy tissue	Cells subrounded, containing clusters of calcium oxalate; about 11~40μm in diameter.
5. Lower epidermal cells	Relatively small; occasionally having mucilage cells.
6. Vascular bundles of midrib	Collateral, the inner side of the upper and lower epidermis having 1~2 rows of collenchymatous cells.

叶横切面组织图注

1. 非腺毛	单细胞，长32~240μm，直径24~32μm，具角质短线纹。
2. 上表皮细胞	较大，切向延长，外壁较厚，内壁黏液化，常膨胀呈半圆形。
3. 栅栏组织	2~3列细胞。
4. 海绵组织	细胞类圆形，含草酸钙簇晶，直径11~40μm。
5. 下表皮细胞	较小，偶有黏液细胞。
6. 中脉维管束	外韧型，上下表皮内方有厚角组织细胞1~2列。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Clusters of calcium oxalate	Relatively small; 15~40μm in diameter; crystal cells arranged in longitudinal bunches; each cell containing one cluster. Bright yellow separated by polychrome in color under a polarizing microscope.
2. Non-glandular hairs	Unicellular, slightly curved; walls somewhat thickened; with clear spiny warts.
3. Epidermal cells	Rectangular or subrounded; anticlinal walls undulantly curved; some thickened in bead-like form; stomata anisocytic type.

图注

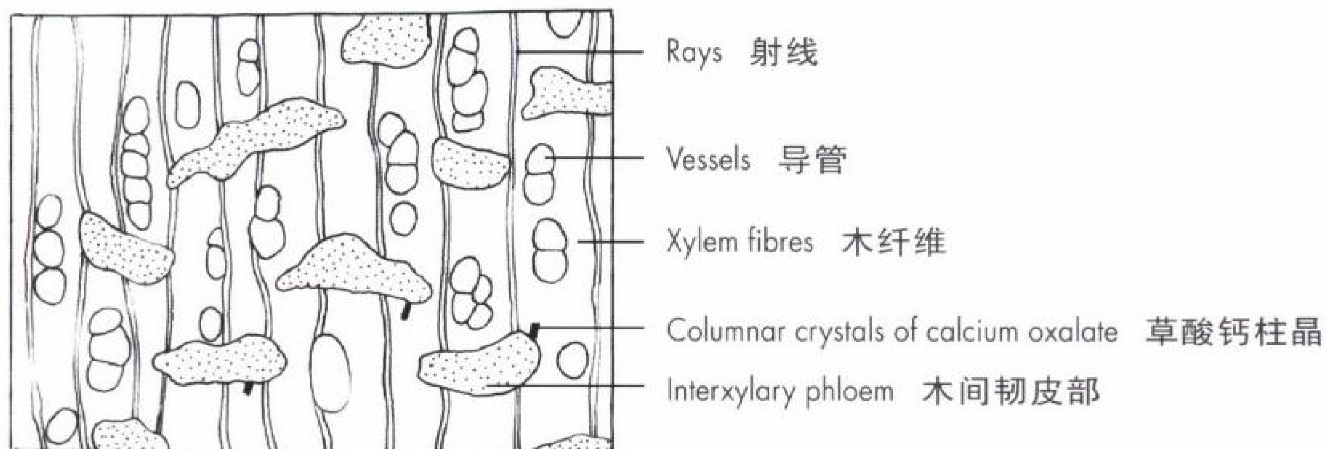
1. 草酸钙簇晶	较小，直径15~40μm，可见晶细胞纵向成串排列，每个细胞内含1簇晶。偏光下呈亮黄间多彩色。
2.非腺毛	单细胞，略弯曲，壁稍厚，有明显的刺状疣突。
3.表皮细胞	长方形或类圆形，垂周壁波状弯曲，有的具串珠状增厚。气孔不等式。

沉香 Chenxiang

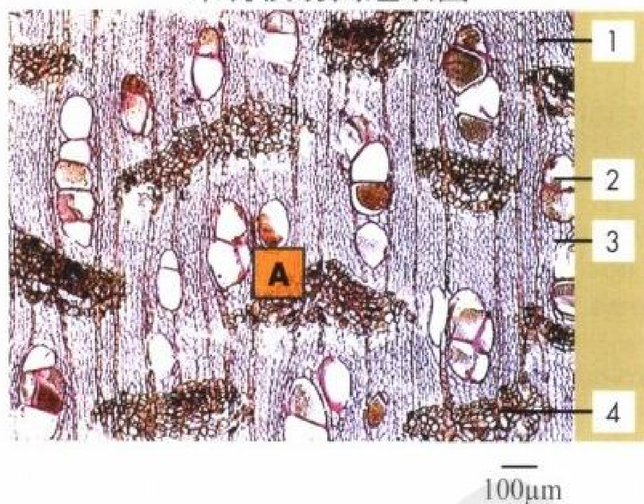


The wood containing resin of *Aquilaria sinensis* (Lour.) Gilg (Fam. Thymelaeaceae).
瑞香科植物白木香含有树脂的木材。

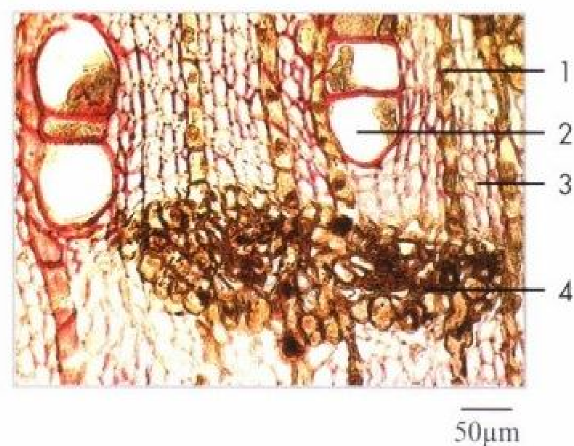
Sketch of transverse section of wood containing resin
木材横切面简图



Transverse section of wood containing resin
木材横切面组织图



A *Transverse section of wood (Enlarged part)*
木材横切面组织图（局部放大）





Transverse section of wood containing resin

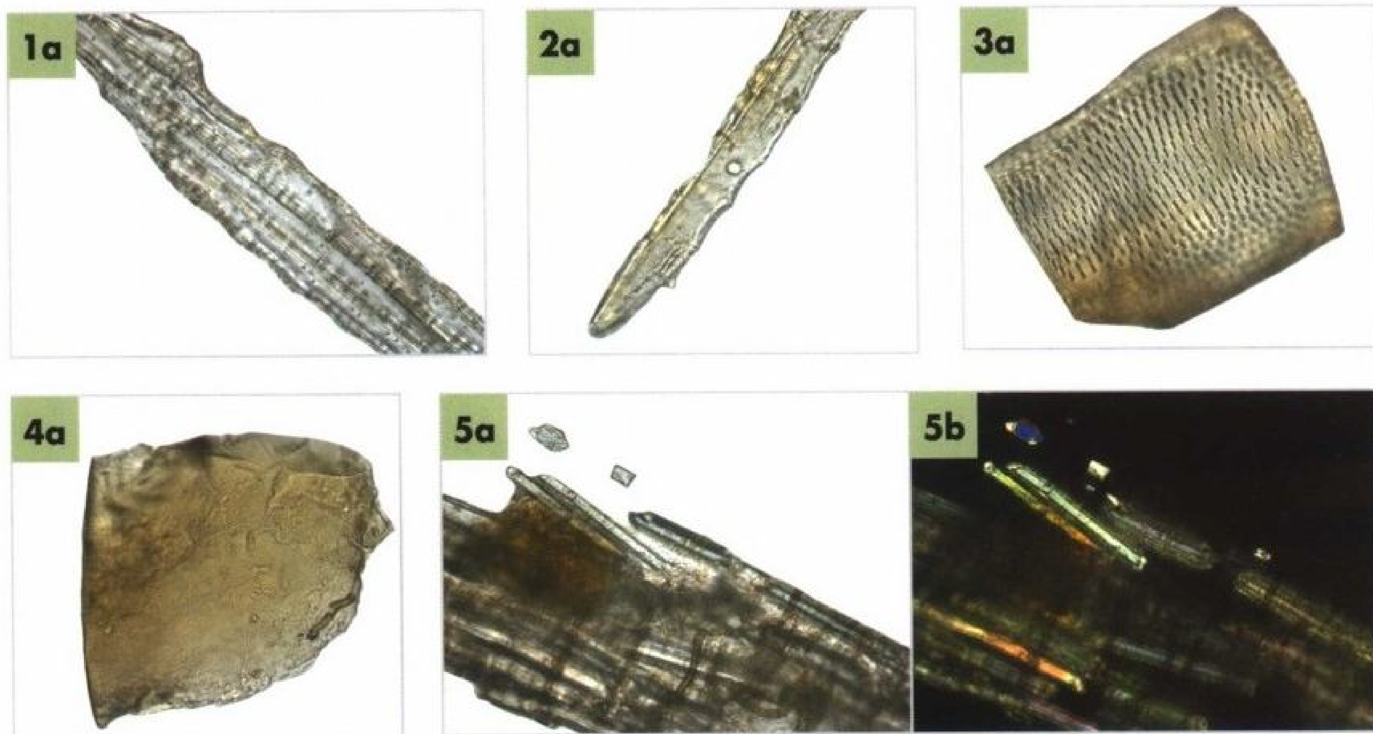
1. Rays	1~2 rows of cells wide; filled with brown resins.
2. Vessels	Round-polygonal; 42~128μm in diameter; some containing brown resins.
3. Xylem fibres	Polygonal, 20~45μm in diameter; with slightly thickened and lignified walls.
4. Interxylary phloem	Flat long-elliptical or stripped; usually intersecting with rays; and the cell walls very thin and non-lignified; containing brown resins. Few fibres scattered; some parenchymatous cells containing columnar crystals of calcium oxalate.

含树脂木材横切面组织图注

1. 射线	宽1～2列细胞，充满棕色树脂。
2. 导管	圆多角形，直径42~128μm，有的含棕色树脂。
3. 木纤维	多角形，直径20～45μm，壁稍厚，木化。
4. 木间韧皮部	扁长椭圆状或条带状，常与射线相交，细胞菲薄，非木化，内含棕色树脂；其间散有少数纤维，有的薄壁细胞含草酸钙柱晶。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibre tracheid	Mostly in bundles; radial walls with bordered pits and pit apertures crossed in cruciate or V-shape.
2. Libriform fibres	Single scattered; long fusiform; usually broken; walls with single and oblique pits. Walls of fibres observed brightly yellowish-white under a polarizing microscope.
3. Vessels	Mainly bordered pitted vessels; 42~128μm in diameter.
4. Resin masses	Yellowish-brown; irregular shape.
5. Columnar crystals of calcium oxalate	9~18μm in diameter. Brightly yellowish-white separated by polychrome observed under a polarizing microscope.

图注

1. 纤维管胞	多成束，径向壁有具缘纹孔，纹孔口相交成十字状或人字形。
2. 韧型纤维	单个散在，长梭形，常碎断，壁有单斜纹孔。偏光显微镜下纤维壁呈亮黄白色。
3. 导管	主为具缘纹孔导管，直径42~128μm。
4. 树脂团块	黄棕色，不规则状。
5. 草酸钙柱晶	直径9~18μm。偏光显微镜下柱晶呈亮黄白色间多彩状。

Lignum Santali Albi

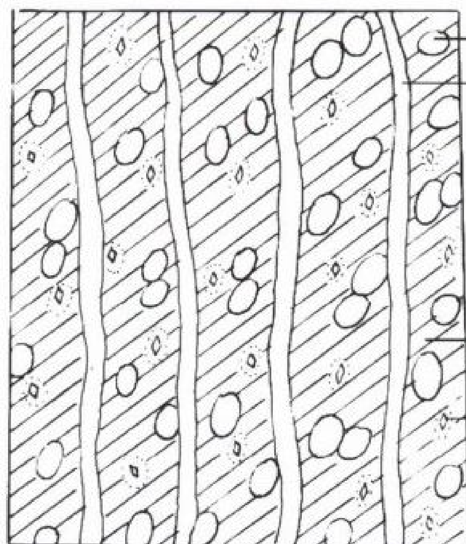
檀香 Tanxiang



The dried heartwood of the stem of *Santalum album* L. (Fam. Santalaceae).

檀香科植物檀香的树干心材。

Sketch of transverse section of heartwood of stem 树干心材横切面简图



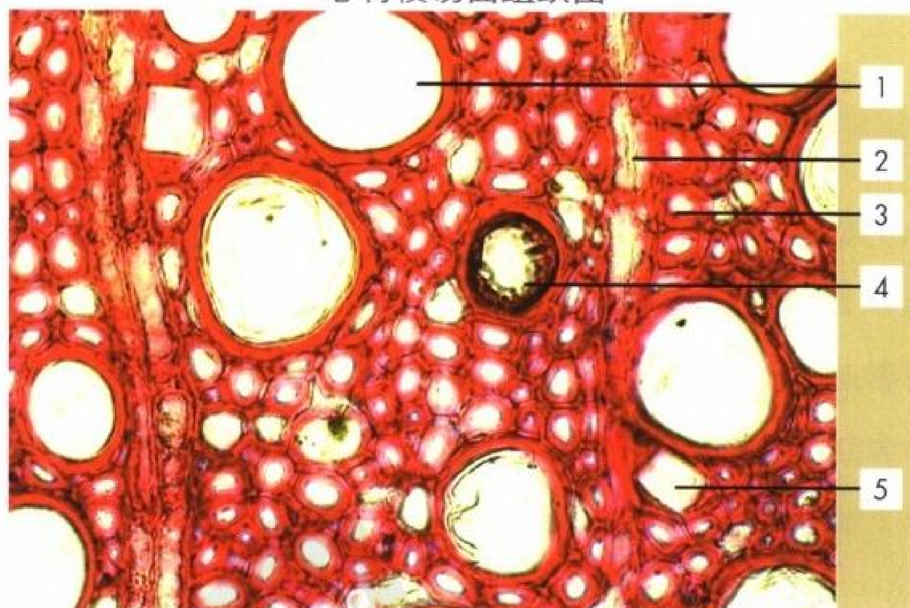
Vessels 导管

Xylem rays 木射线

Xylem fibres and fibre tracheids 木纤维和纤维管胞

Xylem parenchymatous cells 木薄壁细胞

Transverse section of heartwood of stem 心材横切面组织图



50μm

Transverse section of heartwood of stem

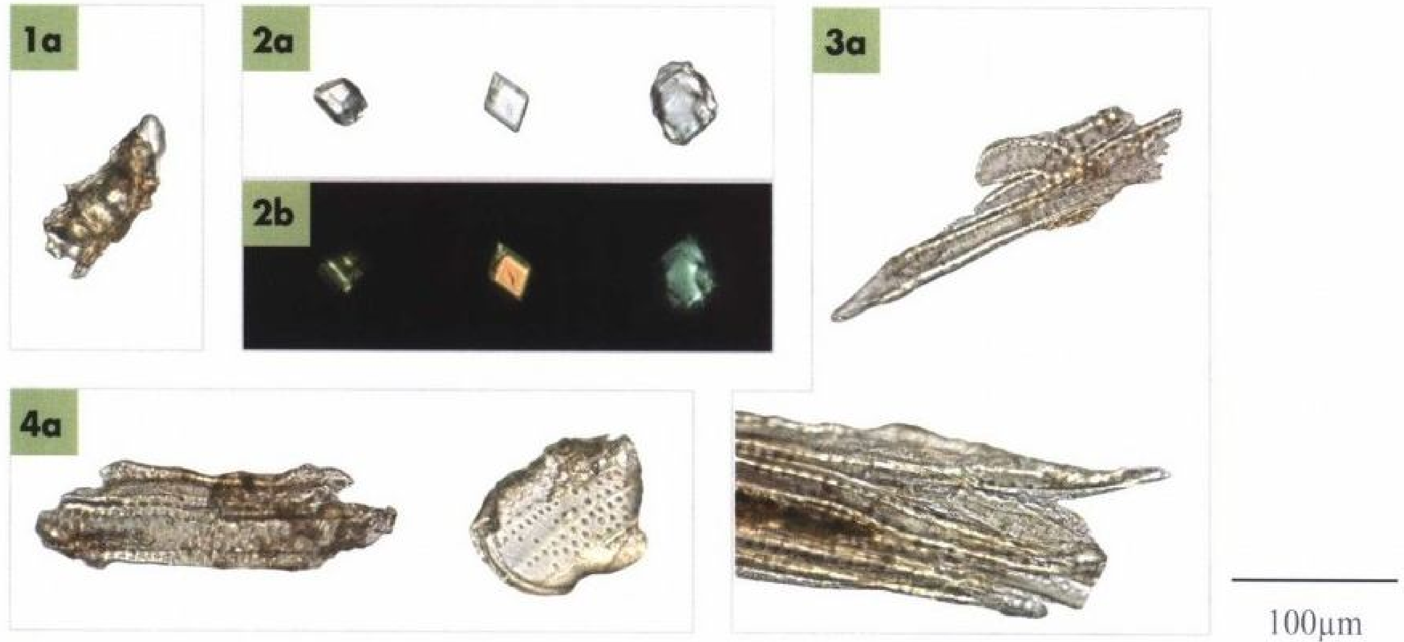
1. Vessels	Singly scattered; sometimes 2~3 aggregated.
2. Xylem rays	Consisting of 1~2 rows of radially elongated cells.
3. Xylem fibres and fibre tracheids	With indistinct differences between them.
4. Secretory cells	Containing brown contents, existed in vessels; ray cells and xylem parenchymatous cells.
5. Xylem parenchymatous cells	Singly scattered or several aggregated; some containing prisms of calcium oxalate.

树干心材横切面组织图注

1. 导管	单个散在，偶有2~3个联合。
2. 木射线	由1~2列径向延长的细胞组成。
3. 木纤维与纤维管胞	两者无明显区别。
4. 分泌细胞	内含红棕色物，存在于导管、射线细胞、木薄壁细胞内。
5. 木薄壁细胞	单个散在或数个联结，有的含草酸钙方晶。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Crystal sclerenchymatous cells	Subsquare, rectangular or subpolygonal in shape; walls lignified and particularly thickened at the corner; striations indistinctly seen; pits unclear; the cellular lumnia containing prisms of calcium oxalates; several or dozens of crystal cells connected longitudinally; present beside fibres leading to the form of crystal fibres.
2. Prisms of calcium oxalates	Abundant, polyhedral, flat subsquare in shape or tail-like and knee-like bicrystals. Brightly visible under a polarizing microscope.
3. Fibres	Present in bundles; pale yellow; relatively long; the walls thickened up to 6μm; single pits ovate or short cleft; pit cannals clear or sometime unclear.
4. Vessels	Bordered pitted vessel; complete ones about 64μm in diameter; on which pits loosely arranged, parallel or in pairs; the pit apertures sometime unclear; vessels often containing reddish-brown or yellowish-brown secretions.

图注

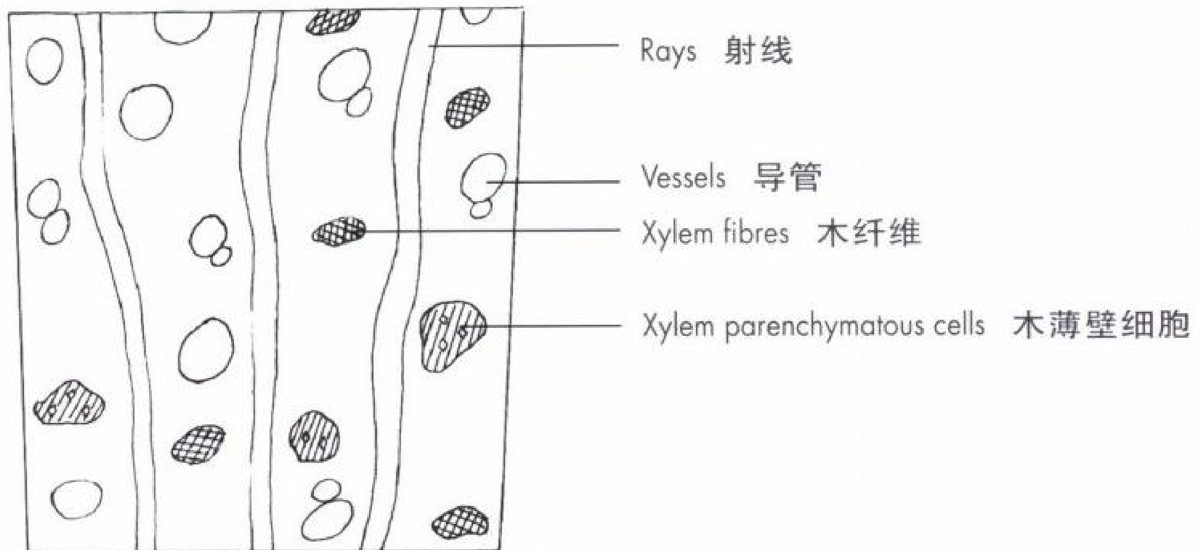
1. 含晶厚壁细胞	呈类方形、长方形或类多角形，壁于角隅处特厚，木化，层纹隐约可见，纹孔不明显，胞腔内含草酸钙方晶。含晶细胞位于纤维旁，数个或数十个纵向相接，形成晶纤维。
2. 草酸钙方晶	较多。多面形、扁类方形，或为鱼尾状双晶、膝状双晶。偏光下明亮可见。
3. 纤维	成束，淡黄色。较长，壁厚约至6μm，单纹孔卵圆形或短缝状，孔沟明显，也有纹孔、孔沟不明显的。
4. 导管	具缘纹孔导管完整者直径约至64μm，纹孔排列较疏，并列或互列，纹孔缘有时不甚显著，导管中常含红棕色或黄棕色分泌物。

苏木 Sumu

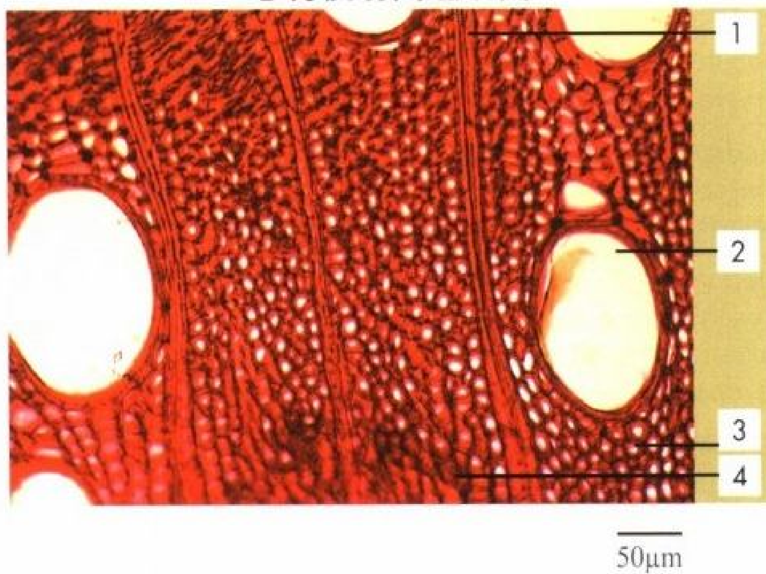


The dried heartwood of *Caesalpinia sappan* L. (Fam. Leguminosae).
豆科植物苏木的干燥心材。

Sketch of transverse section of heartwood
心材横切面简图



Transverse section of heartwood
心材横切面组织图



50μm

Transverse section of heartwood

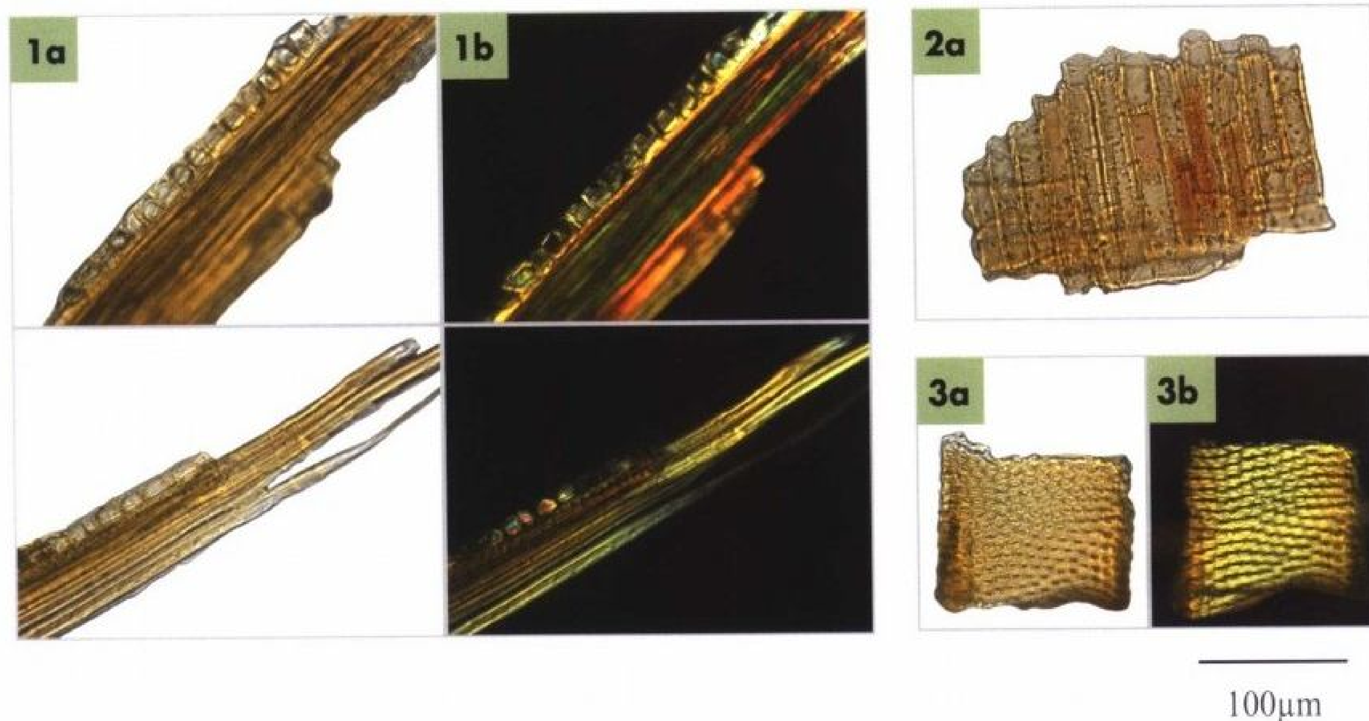
1. Rays	1~2 rows of cells wide.
2. Vessels	Subrounded, about to 160μm in diameter; usually containing yellowish-brown and reddish-brown contents.
3. Xylem fibres	Polygonal, with extremely thickened walls.
4. Xylem parenchymatous cells	Lignified, some containing prisms of calcium oxalate.

心材横切面组织图注

1. 射线	宽1~2列细胞。
2. 导管	类圆形，直径约至160μm，常含黄棕色或红棕色物。
3. 木纤维	多角形，壁极厚。
4. 木薄壁细胞	木化，有的含草酸钙方晶。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Xylem fibres and crystal fibres	Abundant, present in bundles; orange or colorless. Slender, the walls thick or slightly thickened; with sparse oblique pits; the lumina linear or wide. Some cells surrounding fibre bundles containing square crystals of calcium oxalates leading to the form of crystal fibres. Fibres showing yellowish-white and crystals showing polychrome in color under a polarizing microscope.
2. Xylem rays	Fragments of rays easily seen on the radial section; the cells rectangular in shape; the walls lignified to beadlike thickenings on which single pits occurred; pits dense and pit canals clear on the tangentially longitudinal section; the rays 1~3 rows of cell wide and up to 62-cell high; pits clear.
3. Vessels	Bordered pitted vessels varying in size; pits arranged densely and alternately; the pit apertures elliptical or short cleft; the vessels containing brown contents in clumps. Bright yellow in color observed in a polarizing microscope.

图注

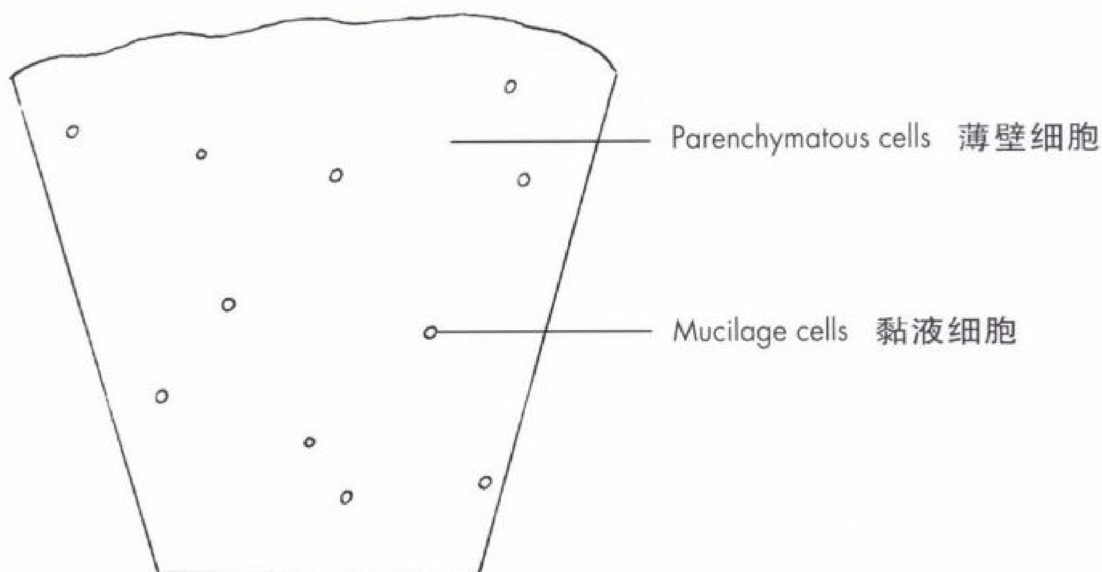
1. 木纤维及晶纤维	极多，成束，橙黄色或无色。纤维细长，壁厚或稍厚，斜纹孔稀疏，胞腔线形或较宽大。有的纤维束周围细胞中，含草酸钙方晶，形成晶纤维。偏光显微镜下纤维呈黄白色，晶体呈多彩色。
2. 木射线	径向纵断面碎片较易见，细胞呈长方形，壁连珠状增厚，木化，具单纹孔，切向壁纹孔较密，孔沟明显；切向纵断面射线宽1~3列细胞，高约至62个细胞，纹孔显著。
3. 导管	具缘纹孔导管大小不一，纹孔排列较密，互列，纹孔口椭圆形或短缝状，导管中含棕色块状物。偏光下呈亮黄白。



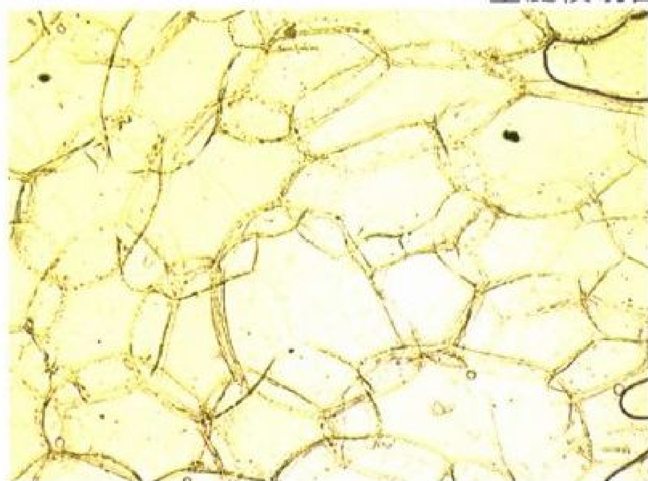
小通草 Xiaotongcao

The dried stem pith of *Stachyurus himalaicus* Hook.f.et Thoms. (Fam. Stachyuraceae).
旌节花科植物喜马山旌节花的干燥茎髓。

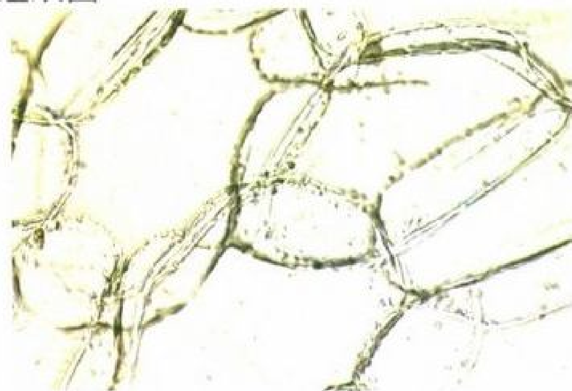
Sketch of transverse section of stem pith 茎髓横切面简图



Transverse section of stem pith 茎髓横切面组织图



50μm



50μm

Transverse section of stem pith

1. Parenchymatous cells Subrounded, elliptical or polygonal; pits sparse; mucilage cells scattered.

茎髓横切面组织图注

1. 薄壁细胞 类圆形、椭圆形或多角形，纹孔稀疏；有黏液细胞散在。



Notes

1. Parenchymatous cells Long polygonal; elliptical polygonal or subrounded polygonal in shape; walls slightly bead-like; pit canals clear; pit apertures elliptical or round dotted.

图注

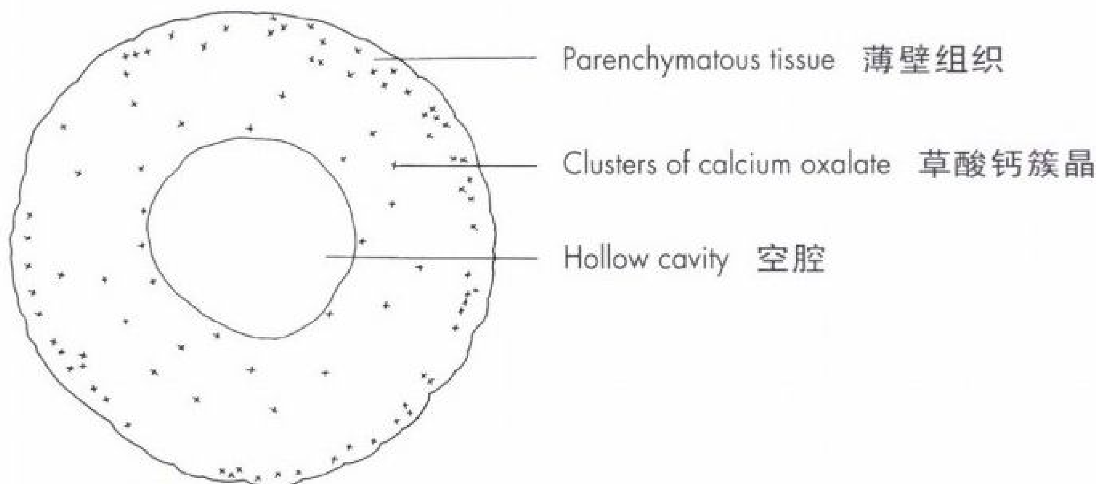
1. 薄壁细胞 长多角形、椭圆状多角形或类圆多角形，壁略呈连珠状，孔沟明显，纹孔口椭圆形或圆点状。



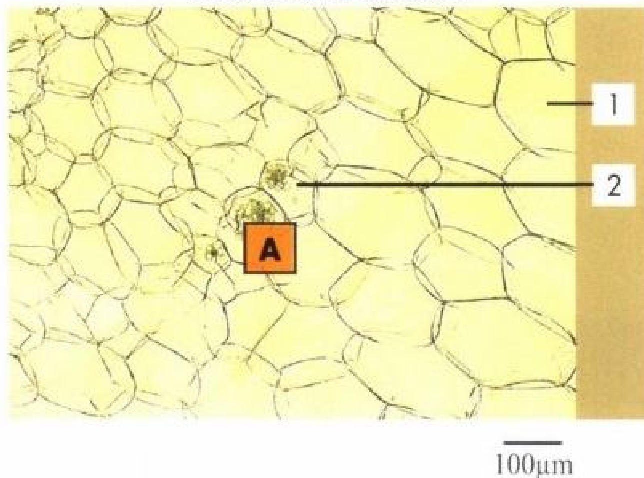
通草 Tongcao

The dried stem pith of *Tetrapanax papyriferus* (Hook.) K. Koch (Fam. Araliaceae).
五加科植物通脱木的干燥茎髓。

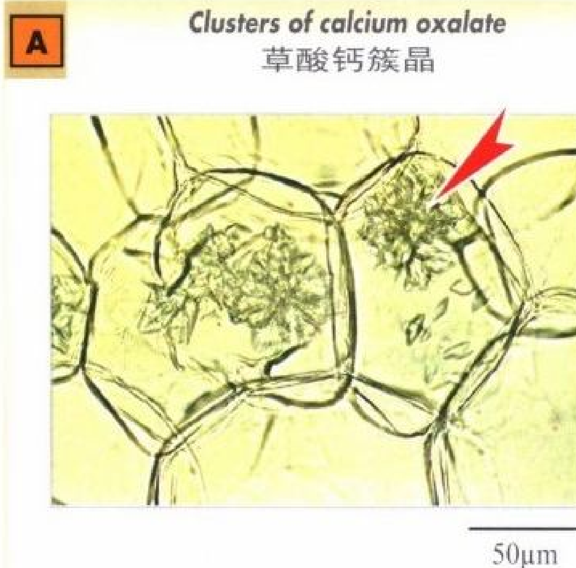
Sketch of transverse section of stem pith 茎髓横切面简图



Transverse section of stem pith
茎髓横切面组织图



A Clusters of calcium oxalate
草酸钙簇晶



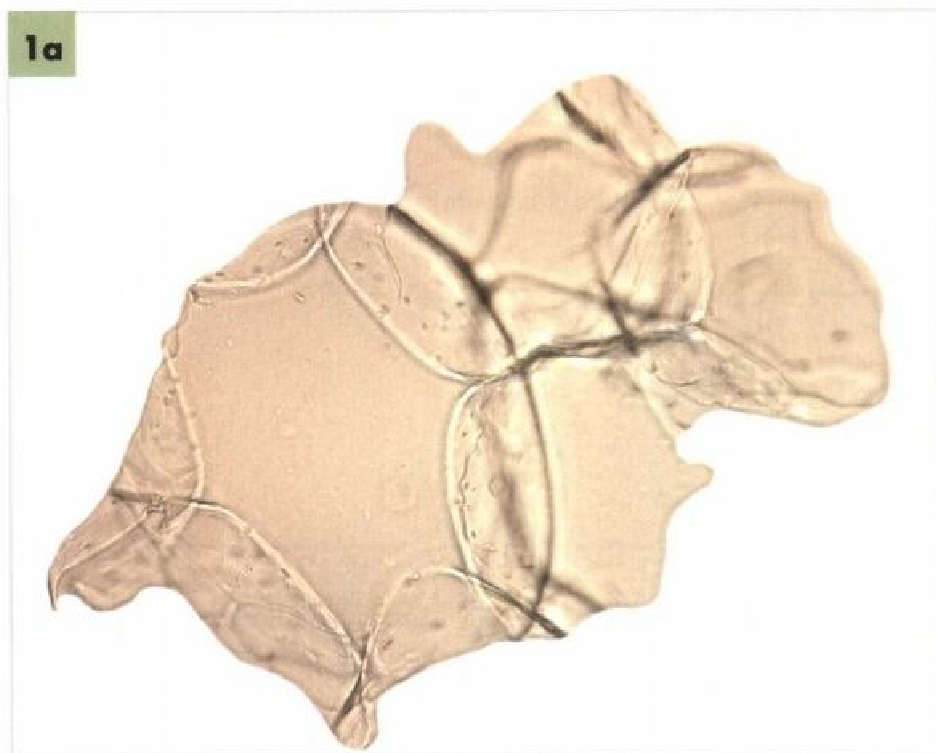
Transverse section of stem pith

1. Parenchymatous	Cells elliptical, subrounded or subpolygonal; the outer cells smaller; pits obivous.
2. Clusters of calcium oxalate	15~64μm in diameter.

茎髓横切面组织图注

1. 薄壁组织	细胞椭圆形、类圆形或近多角形，外侧的细胞较小，纹孔明显。
2. 草酸钙簇晶	直径15～64μm。

Main Powder Characteristics
主要粉末显微特征





100μm

Notes

1. Parenchymatous cells	Subrounded or elliptical, 50~350μm in diameter; round pits easily seen.
2. Clusters of calcium oxalate	Easily seen, 15~64μm in diameter.

图注

1. 薄壁细胞	类圆形或椭圆形，直径50~350μm，纹孔易见，多为圆形。
2. 草酸钙簇晶	易见，直径15~64μm。

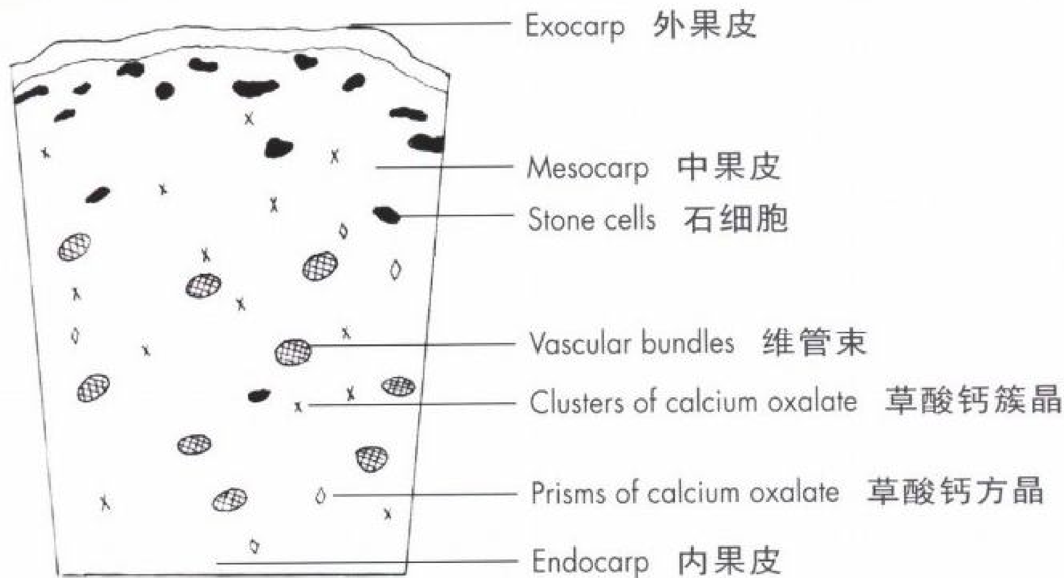
Pericarpium Granati

石榴皮 Shiliupi

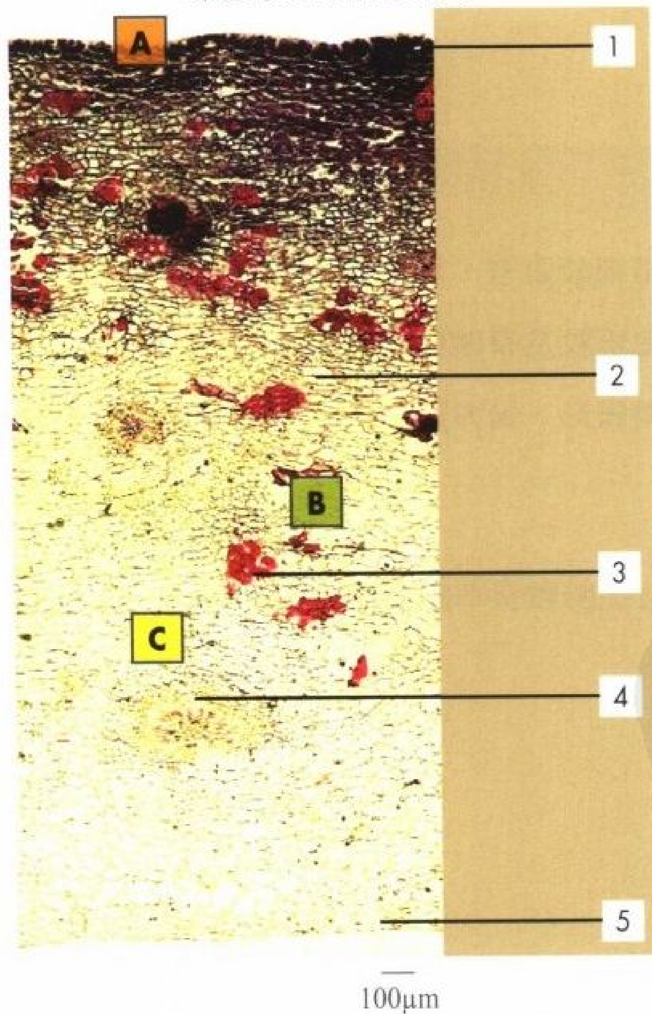


The dried pericarp of *Punica granatum* L. (Fam. Punicaceae).
石榴科植物石榴的干燥果皮。

Sketch of transverse section of pericarp
果皮横切面简图

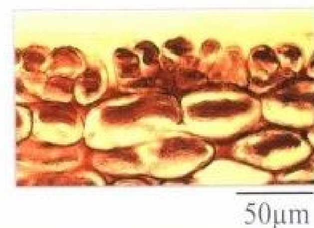


Transverse section of pericarp
果皮横切面组织图



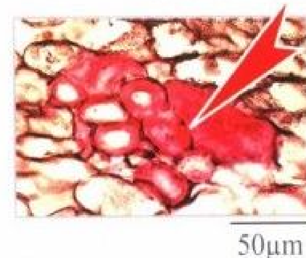
100μm

A *Exocarp*
外果皮



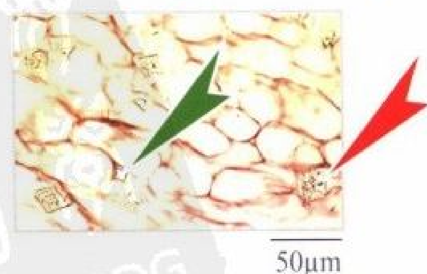
50μm

B *Stone cells*
石细胞



50μm

C *Parenchymatous cells containing clusters "↗" or prisms of calcium oxalate "↗"*
薄壁细胞含有草酸钙簇晶"↗"和方晶"↗"



50μm

Transverse section of pericarp

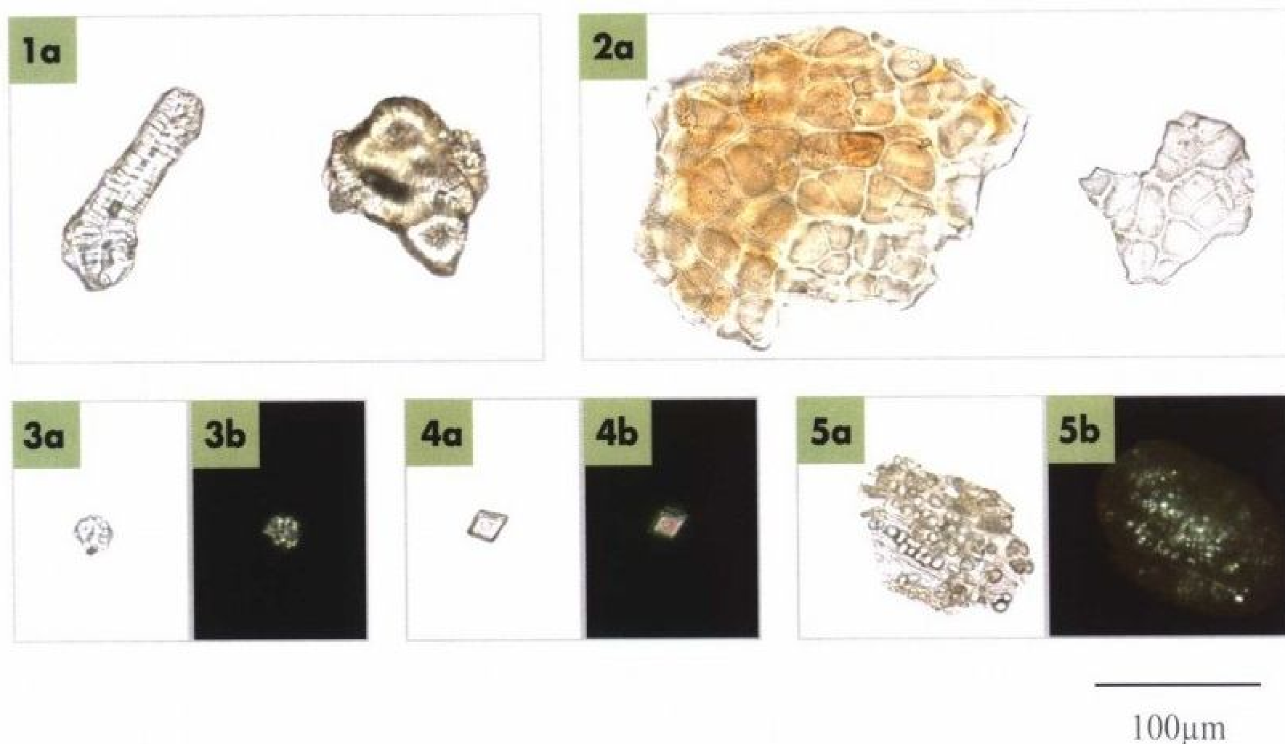
1. Exocarp	Consisting of 1 layer of epidermal cells; arranged relatively densely; covered with cuticles.
2. Mesocarp	Relatively thick; parenchymatous cells containing starch granules and clusters or prisms of calcium oxalate.
3. Stone cells	Singly scattered or in groups; subrounded; rectangular or erose; less ramified with thickened wall.
4. Vascular bundles	Scattered in mesocarp.
5. Endocarp	Parenchymatous cells relatively small; also containing starch granules and crystals of calcium oxalate.

果皮横切面组织图注

1. 外果皮	为一列表皮细胞，排列较紧密，外被角质层。
2. 中果皮	较厚，薄壁细胞含淀粉粒及草酸钙簇晶或方晶。
3. 石细胞	单个散在或成群，类圆形、长方形或不规则形，少数呈分枝状，壁较厚。
4. 维管束	散在于中果皮内。
5. 内果皮	薄壁细胞较小，亦含淀粉粒及草酸钙晶体。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells	Subrounded, rectangular or irregularly shaped; few branched; 27~102μm in diameter; relatively thicken-walled; striations fine; lumina large and some containing brown masses. Brightly orange color observed under a polarizing microscope.
2. Epidermal cells	Subsquare or subrectangular; relatively thicken-walled.
3. Clusters of calcium oxalate	3~25μm in diameter; brightly yellowish-white under a polarizing light.
4. Prisms of calcium oxalate	Rare, 3~15μm in diameter; polychromatic under a polarizing light.
5. Starch granules	Subrounded, 2~10μm in diameter, showing black cruciate shape under a polarizing microscope.

图注

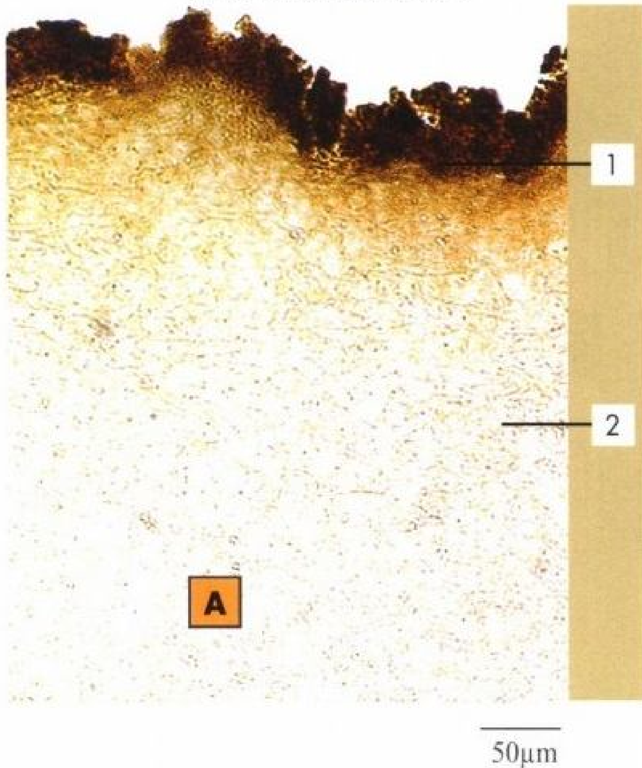
1. 石细胞	类圆形、长方形或不规则形，少数分枝状，直径27~102μm，壁较厚，层纹细密，胞腔大，有的含棕色物。偏光显微镜下细胞壁呈亮橙黄色。
2. 表皮细胞	类方形或类长方形，壁略厚。
3. 草酸钙簇晶	直径3~25μm，偏光显微镜下呈亮黄白色。
4. 草酸钙方晶	稀有，直径3~15μm，偏光显微镜下呈多彩状。
5. 淀粉粒	类圆形，直径2~10μm，偏光显微镜下可见黑十字现象。

猪苓 Zhuling

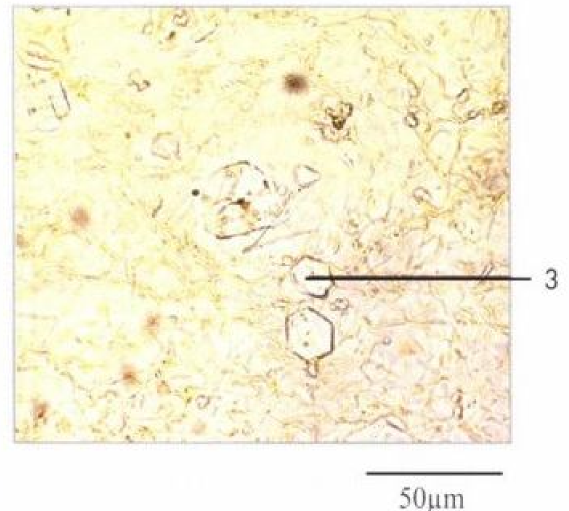


The dried sclerotium of *Polyporus umbellatus* (Pers.) Fries (Fam. Polyporaceae).
多孔菌科真菌猪苓的干燥菌核。

Transverse section of sclerotium
菌核横切面组织图



A **Prisms of calcium oxalate**
草酸钙方晶



Transverse section of sclerotium

1. Outer layer 27~54μm in thickness; hyphae brown in color; uneasily separated.

2. Inner hyphae Colorless, curved; 2~10μm in diameter; some with septa; some branched or with nodular intumescences.

3. Prisms of calcium oxalate Numerous, existed among hyphae; mostly regular octahedron; regular biconical octahedron or irregular polyhedron in shape; 3~60μm in diameter; some up to 68μm long; sometimes several crystals aggregated.

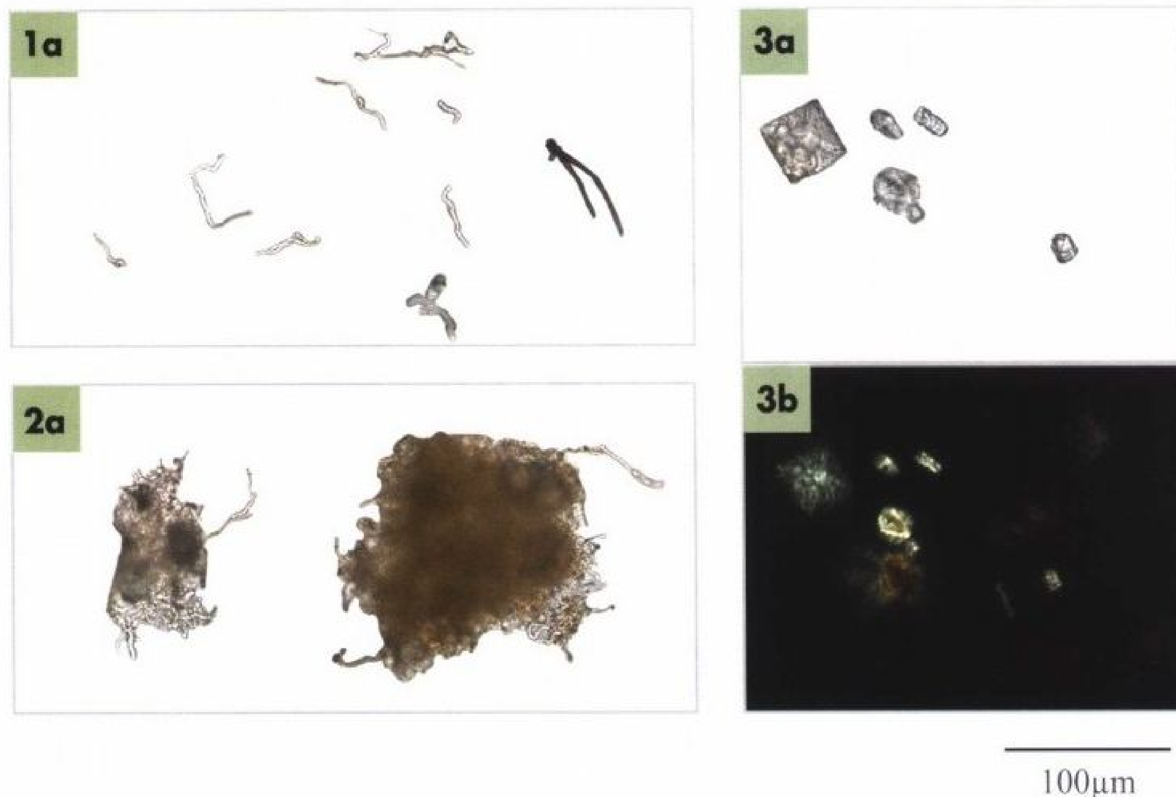
菌核横切面组织图注

1. 外层 厚27~54μm，菌丝棕色，不易分离。

2. 内部菌丝 无色，弯曲，直径2~10μm，有的可见横隔，有分枝或呈结节状膨大。

3. 草酸钙方晶 众多，存在于菌丝间，大多呈正八面体形、规则的双锥八面体或不规则多面体，直径3~60μm，长至68μm，有时数个结晶集合。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Hyphae	Mounted by chloral hydrate and then heated; hyphae appearaing from melted hyphae clumps. Hyphae slender; curved and branched; varing in thickness; brown hyphae relatively thick and septa unclear.
2. Hyphae clumps	Processed by the Schulze's solution: most of them colorless; or few yellowish-brown or dark brown.
3. Prisms of calcium oxalates	Abundant, mainly regular octahedron or regularly double conical octahedron; some being irregular polygonal; 3~60μm in diameter; up to 68μm long; several crystals aggregated also visible. Bright greenish-white in color of the prisms observed under a polarizing microscope.

图注

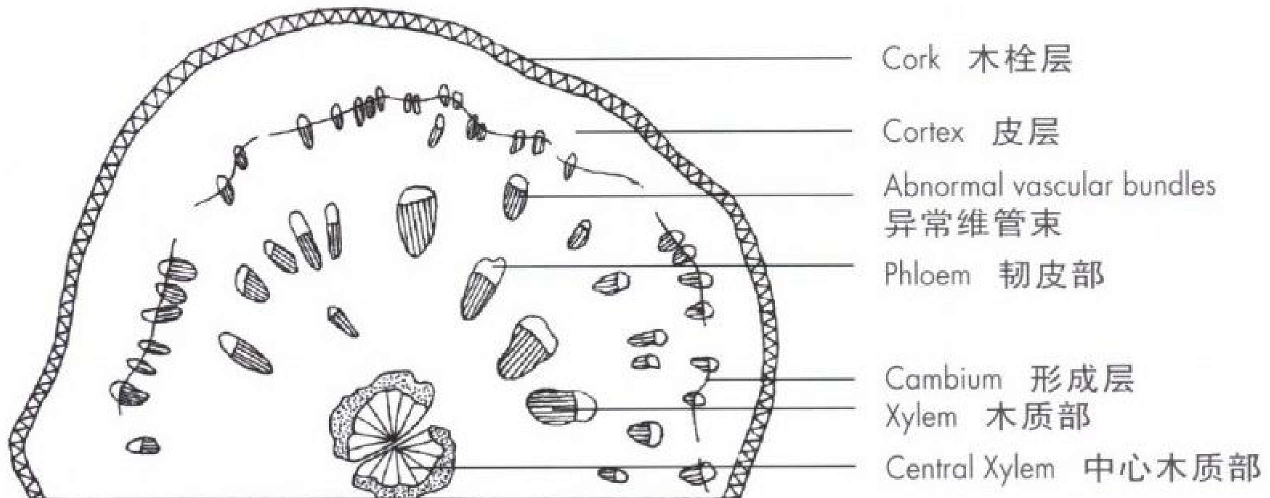
1. 菌丝	水合氯醛液装片加热后，菌丝团块溶化，露出菌丝。菌丝细长，弯曲，有分枝，粗细不一，棕色菌丝较粗，横壁不明显。
2. 菌丝团块	用斯氏液装片可见，大多无色，少数黄棕色或暗棕色。
3. 草酸钙方晶	极多，大多呈正八面体或规则的双锥八面体，也有呈不规则多面形，直径3~60μm，长至68μm，有时可见数个结晶集合。偏光显微镜下晶体呈青白色。

牛膝 Niuxi

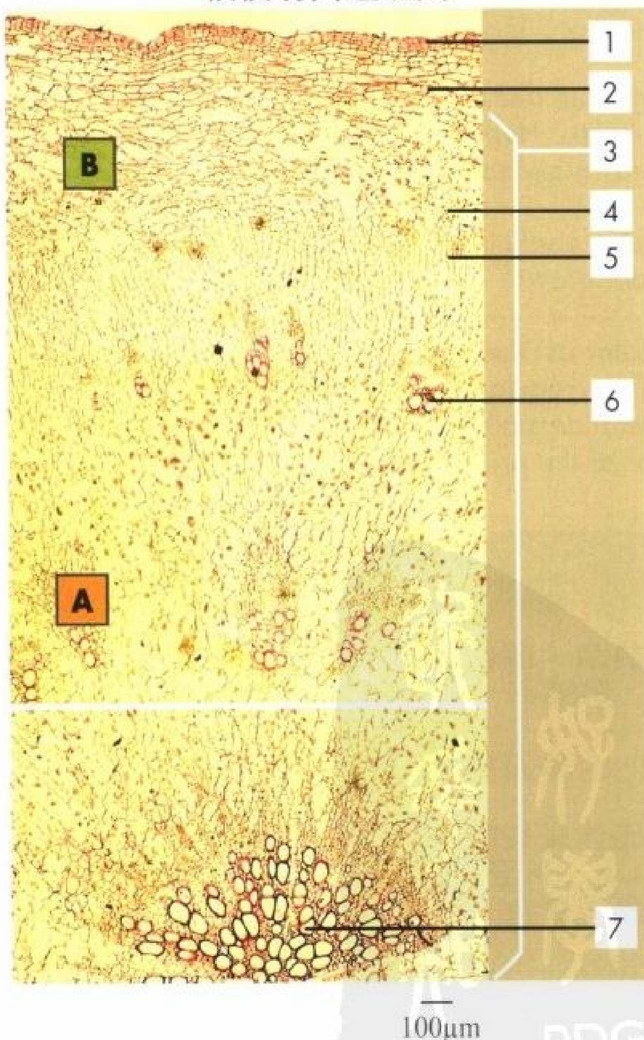


The dried root of *Achyranthes bidentata* Bl. (Fam. Amaranthaceae)
苋科植物牛膝的干燥根。

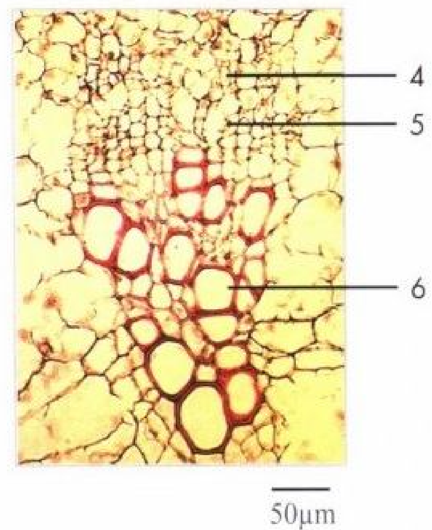
Sketch of transverse section of root
根横切面简图



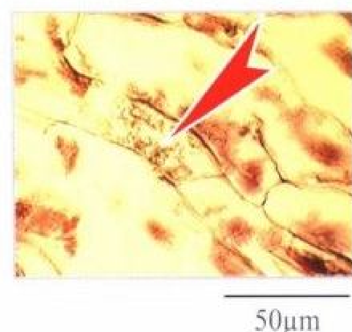
Transverse section of root
根横切面组织图



A *A vascular bundle*
一个维管束



B *Parenchymatous cells containing sandy crystals*
薄壁细胞含有草酸钙砂晶



Transverse section of root

1. Cork	Consisting of several rows of suberized cells.
2. Cortex	Narrow.
3. Stele	Numerous abnormal vascular bundles arranged interruptedly in 2~4 whorls; relatively small in the outermost whorl; sometimes only 1 or several vessels.
4. Phloem	In the outer part of vascular bundles.
5. Cambium	Nearly in a ring.
6. Xylem	Consisting of vessels; xylem fibres and xylem parenchymatous cells.
7. Central xylem	In diarch type.
Parenchymatous cells	Containing sandy crystals of calcium oxalate.

根横切面组织图注

1. 木栓层	为数列木栓化细胞。
2. 皮层	窄。
3. 中柱	有多数异常维管束断续排列成2~4轮，最外轮维管束较小，有时仅1至数个导管。
4. 韧皮部	位于维管束外部。
5. 形成层	近成环。
6. 木质部	由导管、木纤维及木薄壁细胞组成。
7. 中心木质部	二原型。
薄壁细胞	含草酸钙砂晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Sandy crystals of calcium oxalate	Filled up or scattered in parenchymatous cells; very fine; triangular, arrow-shaped; subsquare or irregular shaped. Brightly yellowish-white in color observed under a polarizing microscope.
2. Vessels	Mainly bordered pitted vessels; up to above 80μm in diameter; bordered pits alternate; some 2 pits juxtaposed; some pit apertures beyond the brim of pits. Brightly yellowish-white in color observed under a polarizing microscope.
3. Xylem fibres	In bundles; or accompanied with vessels; relatively long; with relatively thin walls, non-lignified; pits scarce. Brightly yellowish-white in color observed under a polarizing microscope.
4. Xylem parenchymatous cells	Subrectangular, slightly lignified.

图注

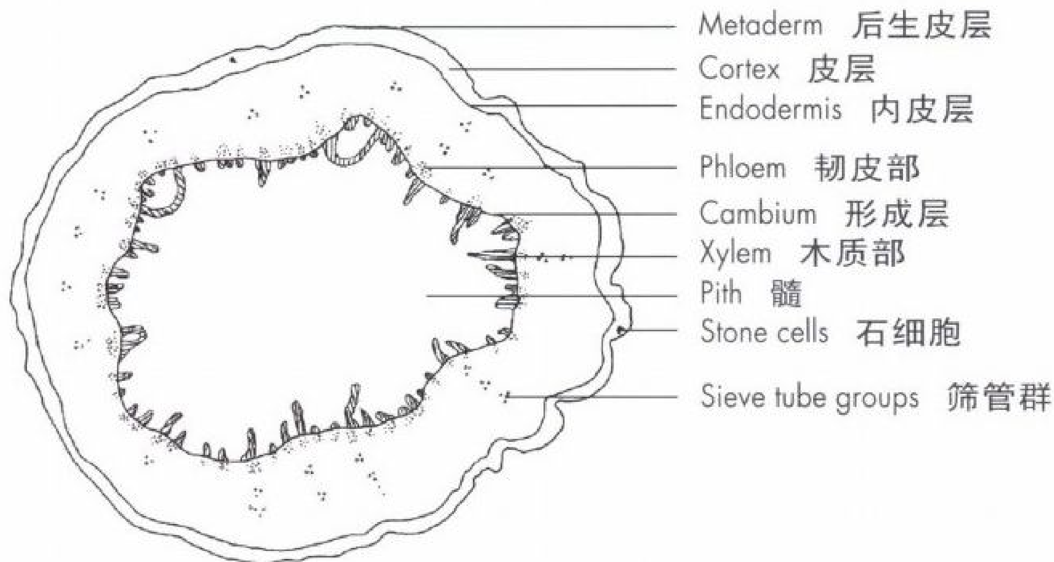
1. 草酸钙砂晶	充塞或散在于薄壁细胞中，极细小，呈三角形、箭头形、类方形或不规则形。偏光显微镜下呈亮黄白色。
2. 导管	主为具缘纹孔导管，直径至80μm以上，具缘纹孔互列，有的2个并列，有的纹孔口超出纹孔缘。偏光显微镜下呈亮黄白色。
3. 木纤维	成束，或于导管伴随。较长，壁较薄，非木化，纹孔稀疏。偏光显微镜下呈亮黄白色。
4. 木薄壁细胞	类长方形，微木化。

川乌 Chuanwu



The dried axial root of *Aconitum carmichaeli* Debx. (Fam. Ranunculaceae).
毛茛科植物乌头的干燥母根。

Sketch of transverse section of axial root
母根横切面简图



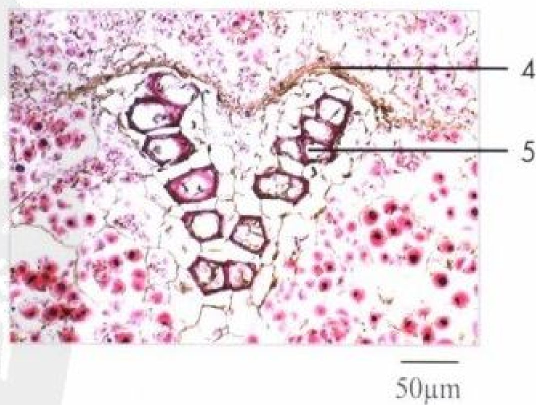
Transverse section of axial root
母根横切面组织图



A Stone cells in cortex
皮层中的石细胞



B Xylem
木质部



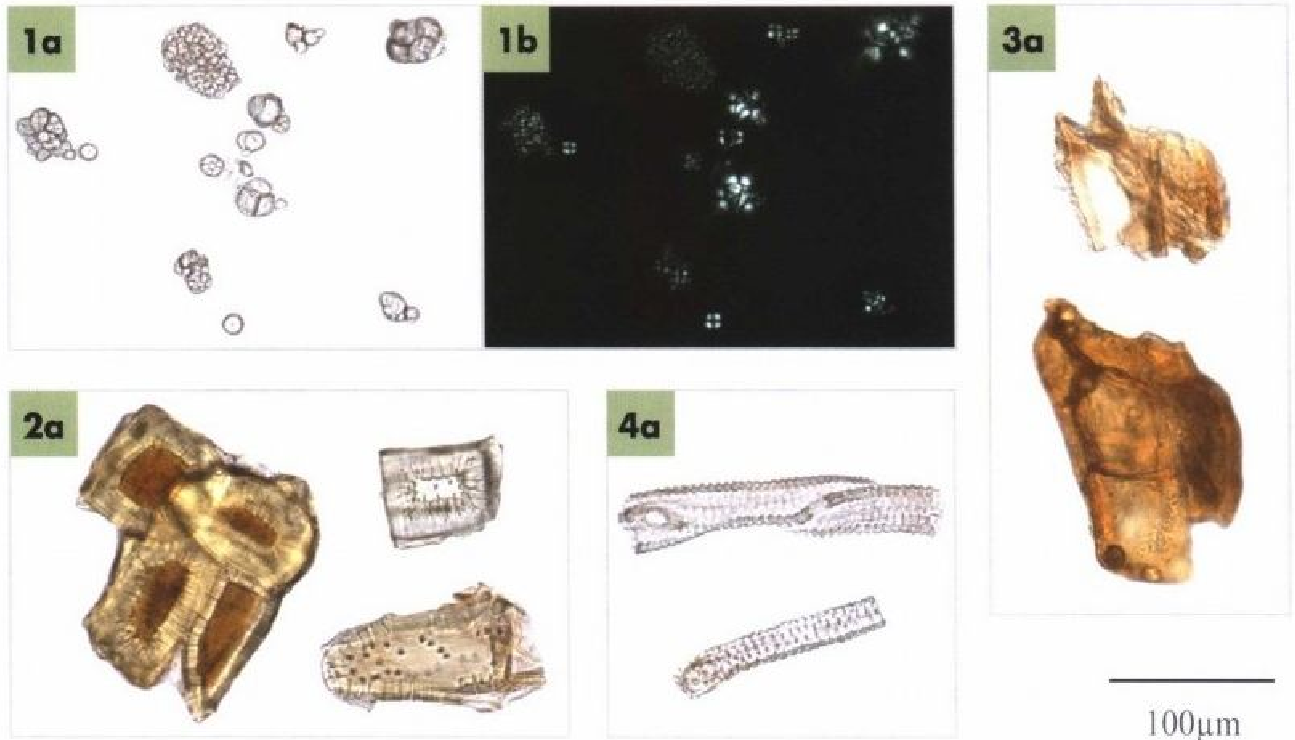
Transverse section of the axial root

1. Metaderm	Consisting of the brown corkificated cells.
2. Cortex	Stone cells scattered in parenchyma; singly scattered or several in groups; subrectangular or long-elliptical; striations of cells with thickened walls distinct.
3. Phloem	With sieve tube groups scattered.
4. Cambium	Subpolygonal.
5. Xylem	Numerous vessels arranged in several radial rows or in V-shape.
6. Pith	Distinct, parenchymatous cells filled with starch granules.

母根横切面组织图注

1. 后生皮层	为棕色木栓化细胞。
2. 皮层	石细胞散在于薄壁组织中；单个散在或数个成群，类长方形或长椭圆形，壁厚者层纹明显。
3. 韧皮部	散有筛管群。
4. 形成层	类多角形。
5. 木质部	导管多列，呈径向或略呈“V”形排列。
6. 髓部	明显，薄壁细胞内充满淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Numerous, simple granules globular; long rounded or kidney-shaped; 3 ~22μm in diameter; compound granules composed of 2 ~15 components. Black cruciate shape showing obviously under a polarizing microscope.
2. Stone cells	Nearly colorless or pale yellowish-green; subrectangular, subsquare, polygonal or with one side oblique; 49~117μm in diameter and 113~280μm in length; walls 4 ~13μm thick; striations of cells with thickened walls distinct; pits relatively sparse.
3. Metaderm cells	Brown, some with walls tubercularly thickened and intruding into lumina.
4. Vessels	Pale yellow; mainly bordered pitted vessels; 29~70μm in diameter; ends truncate or shortly pointed; perforations in end walls or lateral walls; some vessel cells thick and short; distorted or crisscrossed.

图注

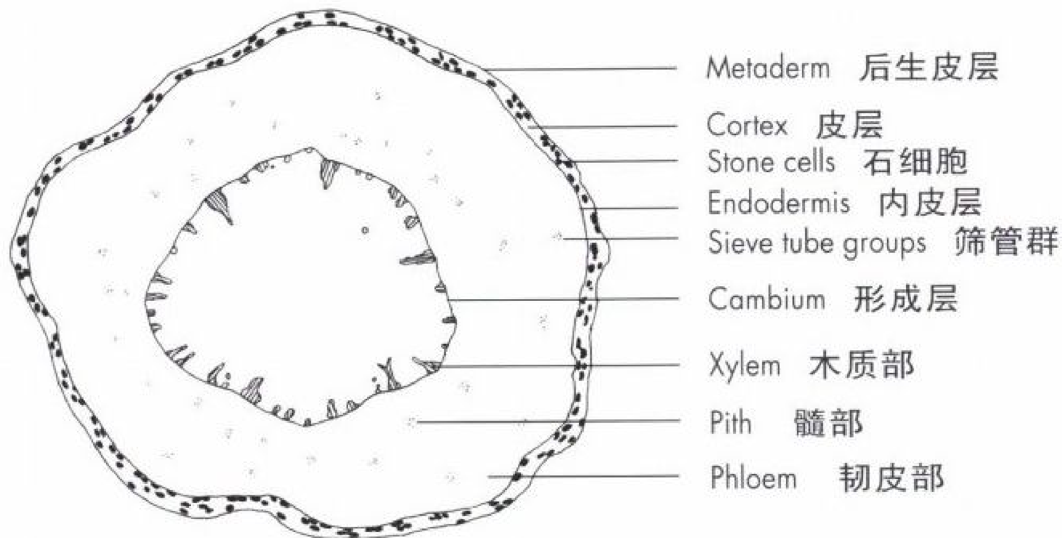
1. 淀粉粒	甚多，单粒球形、长圆形或肾形，直径3~22μm；复粒由2~15分粒组成。偏光显微镜下黑十字现象明显。
2. 石细胞	近无色或淡黄绿色，成类长方形、类方形、多角形或一边斜尖，直径49~117μm，长113~280μm，壁厚4~13μm，壁厚者层纹明显，纹孔较稀疏。
3. 后生皮层细胞	棕色，有的壁呈瘤状增厚突入细胞腔。
4. 导管	淡黄色，主为具缘纹孔导管，直径29~70μm，末端平截或短尖，穿孔位于端壁或侧壁，有的导管分子粗短扭曲或纵横连接。

草 乌 Caowu

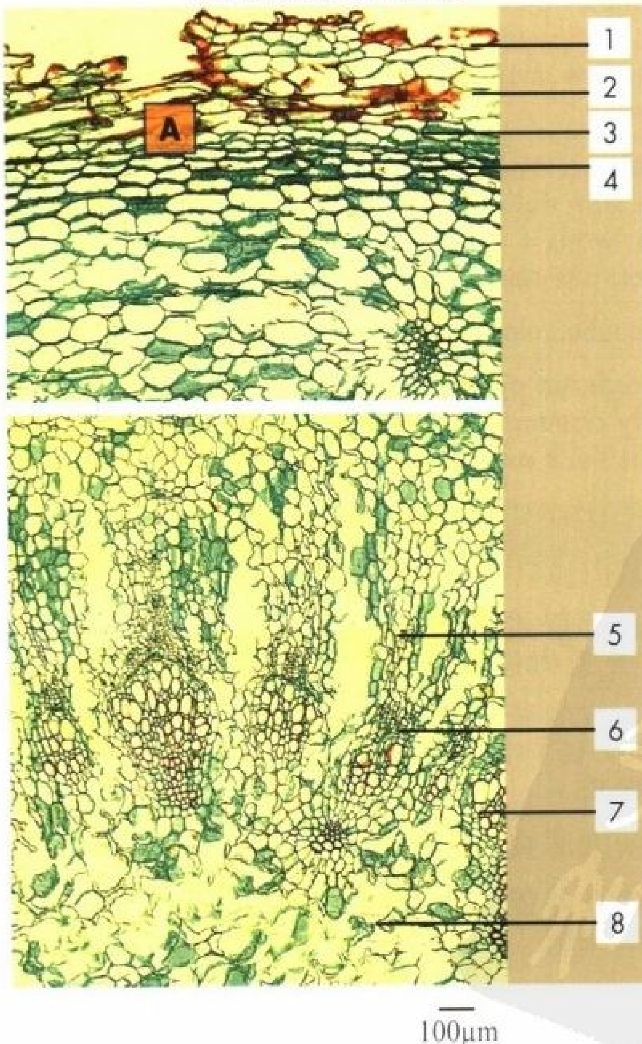


The dried root tuber of *Aconitum kusnezoffii* Reichb. (Fam. Ranunculaceae).
毛茛科植物北乌头的块根。

Sketch of transverse section of root tuber 块根横切面简图



Transverse section of root tuber 块根横切面组织图



A *Stone cells in cortex* 皮层内的石细胞



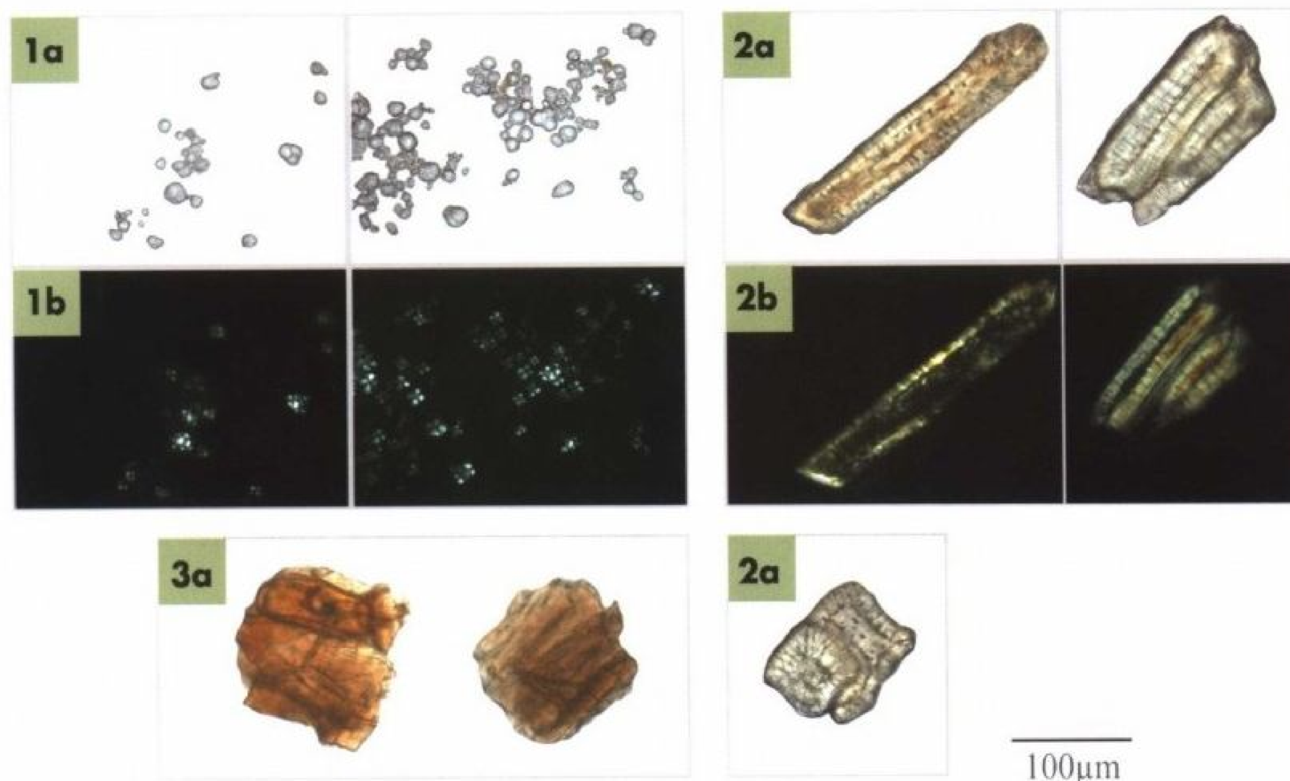
Transverse section of root tuber

1. Metaderm	Consisting of 7~8 rows of brownish-yellow suberized cells.
2. Cortex	With stone cells.
3. Stone cells	Single scattered or 2~5 in groups, subrectangular, square or oblong, lumina large.
4. Endodermis	Distinct.
5. Phloem	Broad, usually with irregular clefts, groups of sieve-tubes abundant.
6. Cambium ring	Irregulary polygonal.
7. Xylem	Vessels 1~4 rows or several in groups, located inside of cambium corners, some containing brownish-yellow contents.
8. Pith	Large. Parenchymatous cells filled with starch granules.

块根横切面组织图注

1. 后生皮层	为7~8列棕黄色木栓化细胞。
2. 皮层	有石细胞。
3. 石细胞	单个散在或2~5个成群，类长方形、方形或长圆形，胞腔大。
4. 内皮层	明显。
5. 韧皮部	宽广，常有不规则裂隙，筛管群随处可见。
6. 形成层环	呈不规则多角形。
7. 木质部	导管1~4列或数个相聚，位于形成层角隅的内侧，有的内含棕黄色物。
8. 髓部	较大。薄壁细胞充满淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Simple granules subrounded. Compound granules consisting of 2~16 components. Black, cruciate shape observed under a polarizing microscope.
2. Stone cells	Relatively big; subsquare, subrectangular, subrounded, fusiform or strip-shaped in shape; colourless; some cells adhering to the fragment of metaderm showing brown in color; walls varying in thickness; the thick-walled cells with distinct striations and fine pits; some containing brown contents. Brightly yellowish-white cell walls under a polarizing microscope.
3. Cells of metaderm	Brown or yellowish-brown; subsquare or long-polygonal on the surface view; walls unevenly thickened; some showing tubercules and projecting to lumina.

图注

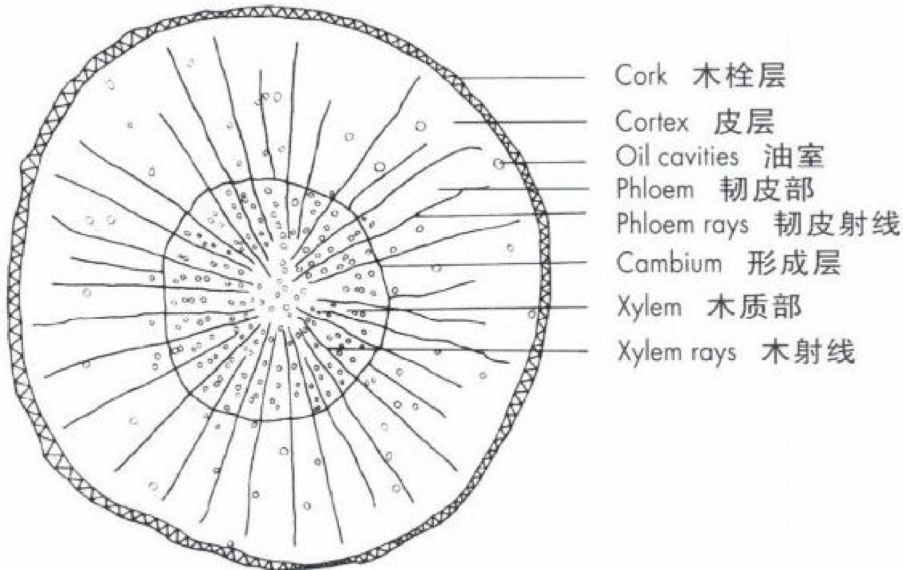
1. 淀粉粒	单粒类圆形；复粒由2分粒~16分粒组成。偏光下微镜下呈黑十字现象。
2. 石细胞	较大，呈类方形、类长方形、类圆形、梭形或长条形，无色，与后生皮层连结的显棕色，壁厚薄不一，壁厚者层纹明显，纹孔细，有的含棕色物。偏光显微镜下细胞壁呈亮黄白色。
3. 后生皮层细胞	棕色或黄棕色，表面观呈类方形或长多角形，壁不均匀增厚，有的呈瘤状突入细胞腔。



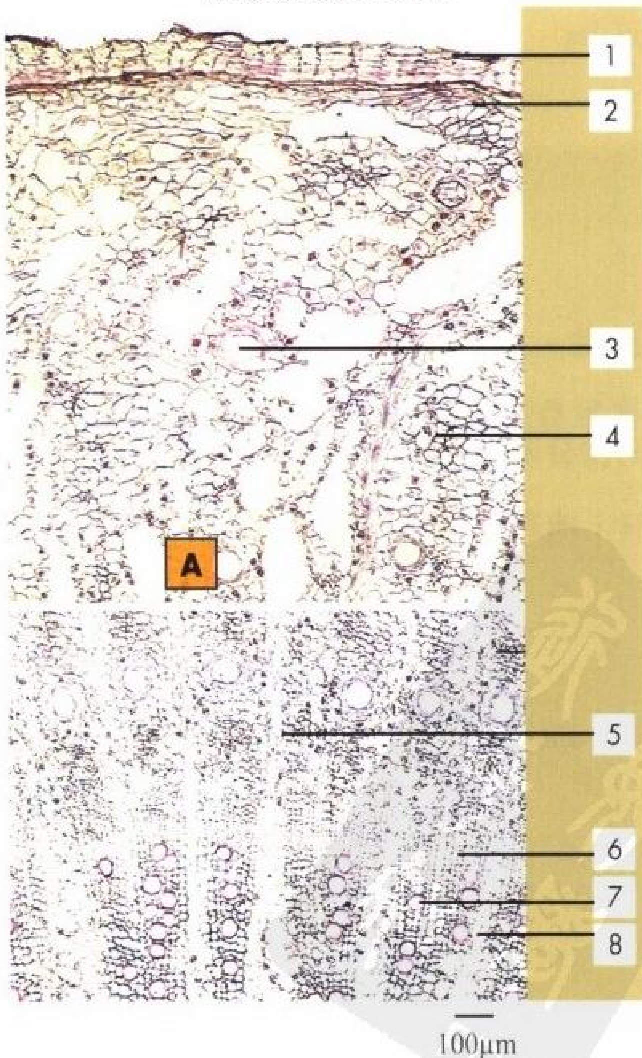
独活 Duhuo

The dried root of *Angelica pubescens* Maxim. f. *biserrata* Shan et Yuan (Fam. Umbelliferae).
伞形科植物重齿毛当归的干燥根。

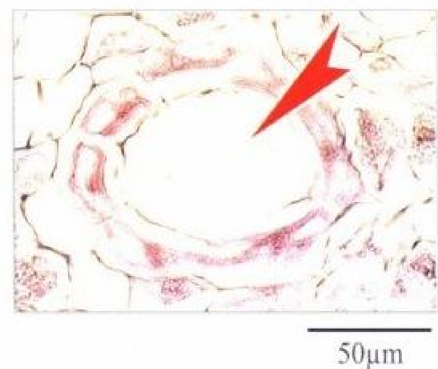
Sketch of transverse section of root 根横切面简图



Transverse section of root 根横切面组织图



A *Oil cavity* 油室



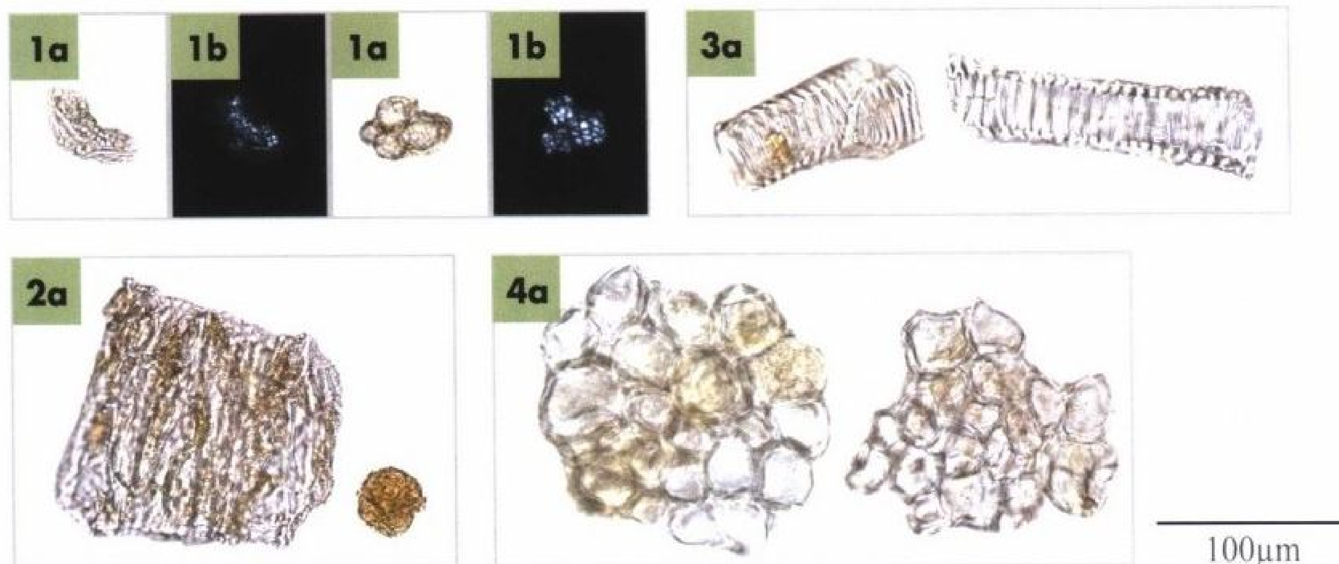
Transverse section of root

1. Cork	Several rows of cells.
2. Cortex	Narrow, with clefts and few oil cavities.
3. Oil cavities	Few scattered in cortex; mostly scattered in phloem; oil cavities at the outer side oblong; about up to 153μm in tangential length; surrounded by 6~10 secretory cells.
4. Phloem	Broad, occupying about 1/2 of root diameter; oil cavities relatively abundant; arranged in several whorls.
5. Phloem rays	Distinct.
6. Cambium	In a ring.
7. Xylem	vessels rare; about up to 84μm in diameter; usually arranged singly and radially.
8. Xylem rays	1~2 rows of cells wide.
Parenchymatous cells	Containing starch granules.

根横切面组织图注

1. 木栓层	细胞数列。
2. 皮层	窄，有裂隙和少数油室。
3. 油室	少数散在于皮层，多数存在于韧皮部，外侧油室长圆形，切向长约至153μm，周围分泌细胞6~10个。
4. 韧皮部	宽广，约占根的1/2；油室较多，排成数轮。
5. 韧皮射线	明显。
6. 形成层	成环。
7. 木质部	导管稀少，直径约至84μm，常单个径向排列。
8. 木射线	宽1~2列细胞。
薄壁细胞	含淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Numerous and fine. Simple granules subrounded or elliptical; 2~9μm in diameter; big ones with hilum occasionally; hilum dotted or V-shaped; striations indistinct; compound granules abundant and composed of more than 10 components; scattered easily. Black cruciate shape observed under a polarizing microscope.
2. Fragments of oil cavities	Mostly broken; complete ones with 54~180μm in diameter. Surrounding secretory cells sub-oblong in the transverse section; 9~22μm in diameter; thin walls and slightly shrinkled; lumina usually containing yellowish-green or pale yellowish-green secretions or oil droplets. Secretory cells slender in the longitudinal section.
3. Vessels	Mainly reticulated vessels; spiral ones also observed; 14~81μm in diameter.
4. Cork cells	Colorless or brown. Polygonal or long polygonal on the surface view; 14~54μm in diameter; walls slightly thickened, undulantly curved and lignified; some lumina containing brown mass; subrectangular in the transverse section.

图注

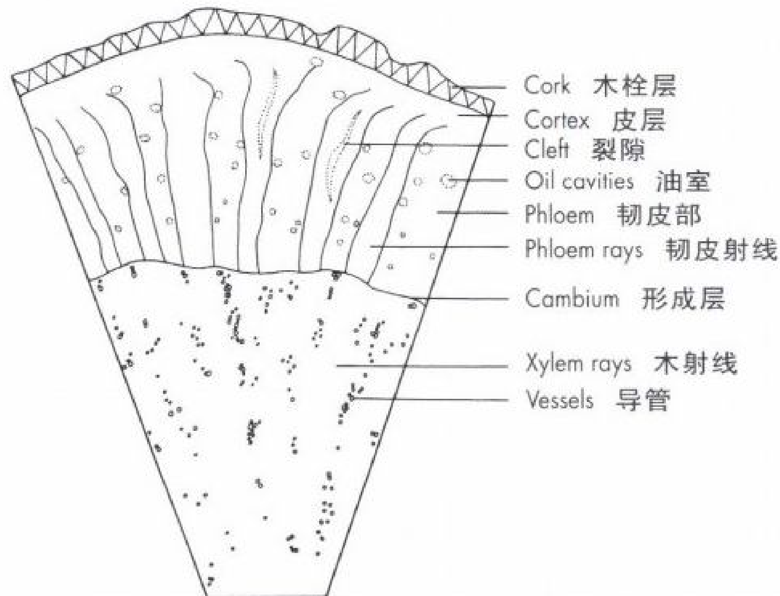
1. 淀粉粒	较多，细小。单粒类圆形或椭圆形，直径2~9μm，大粒偶见脐点，点状或人字状，层纹不明显；复粒较多，由十数个分粒组成，易散离。偏光显微镜下可见黑十字现象。
2. 油室碎片	多破碎，完整者直径54~180μm。横断面观周围分泌细胞呈类长圆形，直径9~22μm，壁薄，稍皱缩，胞腔内大多含黄绿色或淡黄绿色分泌物及油滴；纵断面观分泌细胞狭长。
3. 导管	主为网纹导管，也有螺纹导管，直径14~81μm。
4. 木栓细胞	无色或棕色。表面观多角形或长多角形，直径14~54μm，壁稍厚，略波状弯曲，木化，有的胞腔内含棕色物；横断面观呈类长方形。



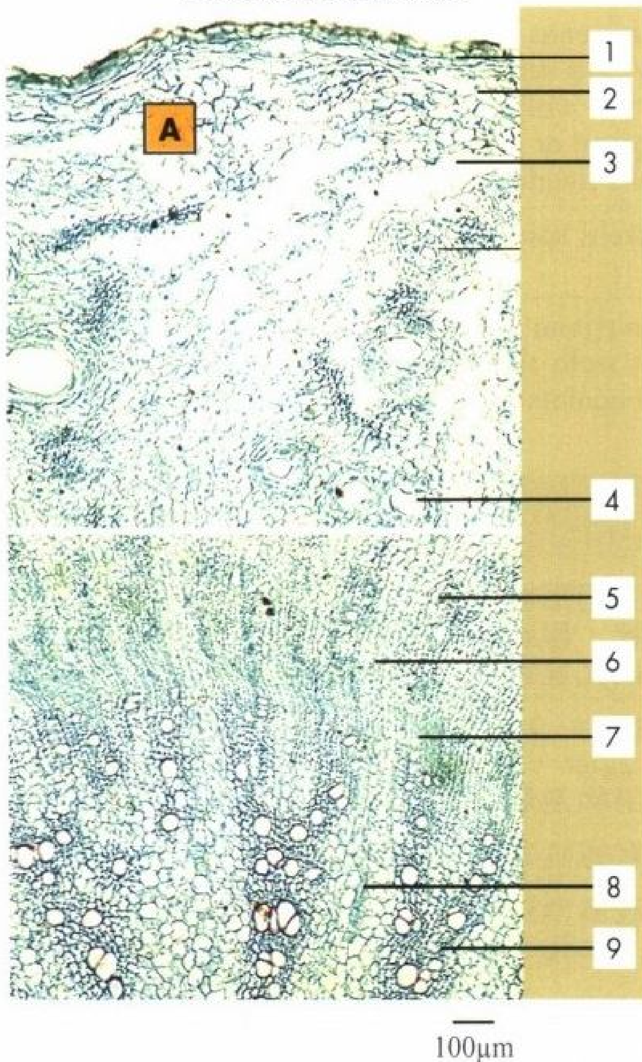
当归 Danggui

The dried root of *Angelica sinensis* (Oliv.) Diels (Fam. Umbelliferae).
伞形科植物当归的干燥根。

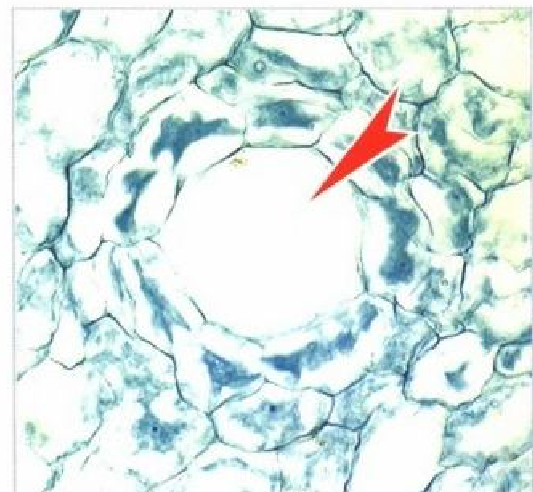
Sketch of transverse section of root
根横切面简图



Transverse section of rootlet
支根横切面组织图



A Oil cavity
油室



Transverse section of rootlet

1. Cork	Several rows of cells.
2. Cortex	Narrow, with few oil cavities.
3. Clefts	Mostly observed in cortex.
4. Oil cavities	25~160μm in diameter, surrounded by 6~9 secretory cells.
5. Phloem	Broad, more clefts, oil cavities and oil tubes subrounded; relatively large on the outer side and gradually becoming small inwards.
6. Phloem ray	Consisting of several rows of cells.
7. Cambium	In a ring.
8. Xylem ray	Relatively broad.
9. Xylem	Rays 3~5 rows of cells wide; vessels singly scattered or 2~3 in groups, arranged radially.

支根横切面组织图注

1. 木栓层	为数列细胞。
2. 皮层	窄，有少数油室。
3. 裂隙	韧皮部多见。
4. 油室	直径25～160μm，周围分泌细胞6～9个。
5. 韧皮部	宽广，多裂隙，油室及油管类圆形，外侧较大，向内渐小。
6. 韧皮射线	数列细胞组成。
7. 形成层	成环。
8. 木射线	较宽。
9. 木质部	射线宽3～5列细胞；导管单个散在或2～3个相聚，成放射状排列。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Phloem parenchymatous cells	Fusiform, walls slightly thickened; with very fine oblique crisscross striations; sometimes thin transverse septa visible.
2. Fragments of oil cavities	Pale yellowish color. Varying in diameter; containing droplets of volatile oil and oily mass.
3. Cork cells	Pale yellowish color. Subpolygonal in surface view; varying in size.
4. Vessels	Mainly scalariform and reticulate vessels; about up to 80μm in diameter.
5. Starch granules	Mostly simple granules; subglobular, 3~22μm in diameter. Black cruciate shape observed under a polarizing microscope.

图注

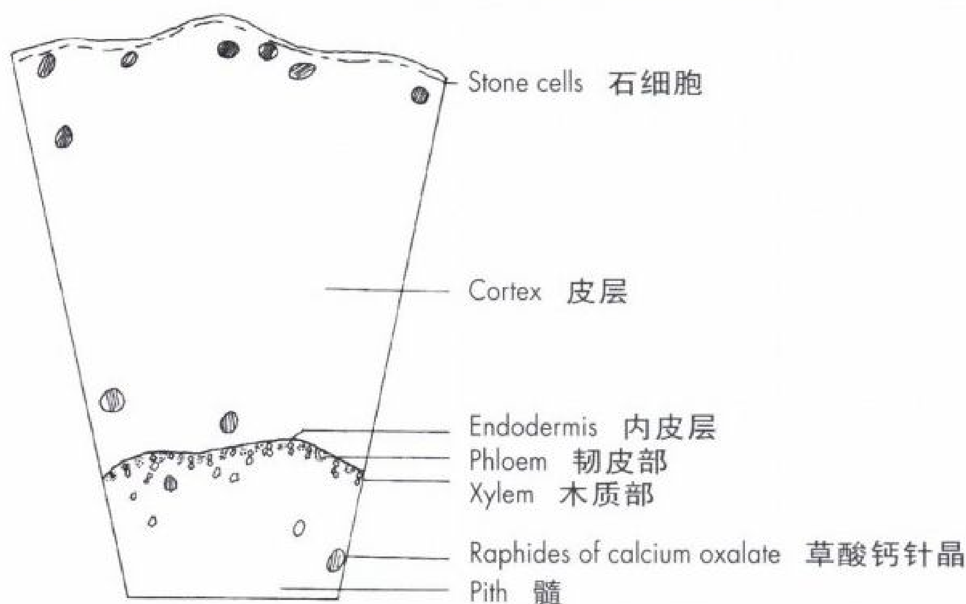
1. 韧皮薄壁细胞	纺锤形，壁略厚，表面有极微细的斜向交错纹理，有时可见菲薄的横隔。
2. 油室碎片	淡黄色。直径不一，内含有挥发油或油块状物。
3. 木栓细胞	淡黄色。表面观呈类多角形，大小不一。
4. 导管	主为梯纹及网纹导管，直径约至80μm。
5. 淀粉粒	多单粒，类球形，直径3~22μm。偏光显微镜下可见黑十字现象。



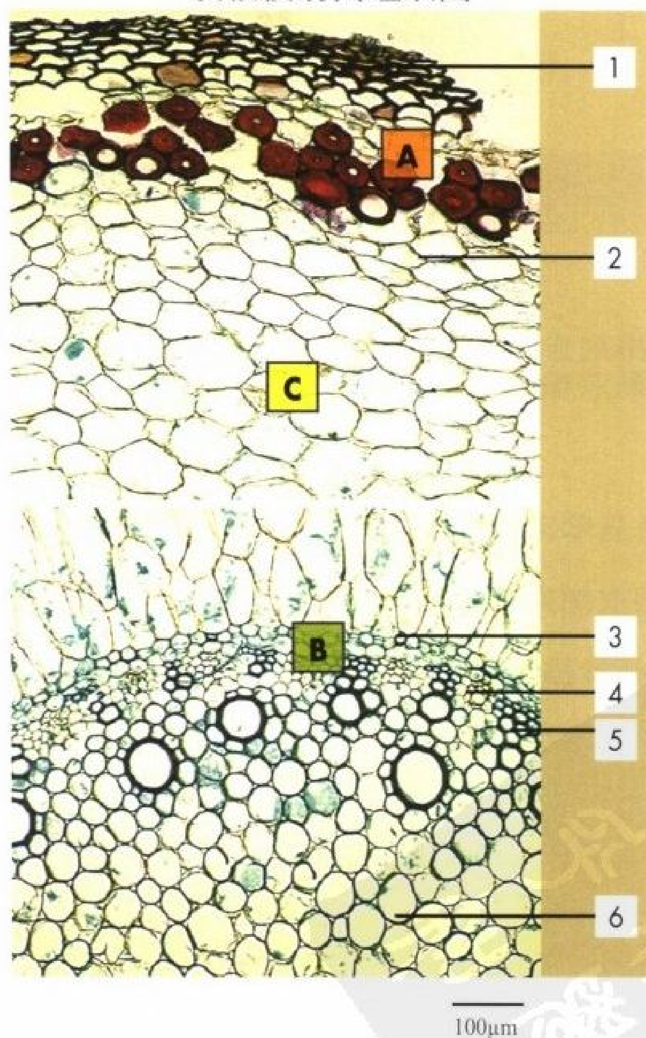
天冬 Tiandong

The dried root tuber of *Asparagus cochinchinensis* (Lour.)Merr. (Fam. Liliaceae).
百合科植物天冬的干燥块根。

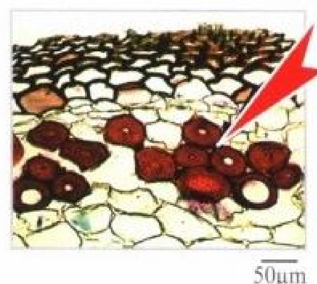
Sketch of transverse section of root tuber 块根横切面简图



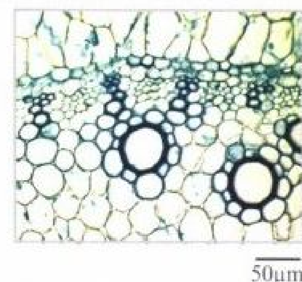
Transverse section of root tuber 块根横切面组织图



A Cortex with stone cells groups on the outer part 皮层外侧石细胞群



B Phloem strands arranged alternately with xylem strands 韧皮部束与木质部束相间排列



C Raphides of calcium oxalate 草酸钙针晶



Transverse section of root tuber

1. Velamen	Several rows of cells, usually desquamated.
2. Cortex	Broad, with stone cell groups on the outer part; arranged in an interrupted ring; mucilage cells scattered, raphides of calcium oxalate occurring in the mucilage cells.
3. Endoderm	Distinct.
4. Phloem strands	31~135, arranged alternately with xylem strands.
5. Xylem strands	31~135, arranged alternately with phloem strands; few vessels penetrating the pith.
6. Pith	Parenchymatous cells also containing raphides of calcium oxalate.

块根横切面组织图注

1. 根被	细胞数列，常剥落。
2. 皮层	宽广，外侧为断续排列成环的石细胞群；有黏液细胞散在，草酸钙针晶束存于黏液细胞中。
3. 内皮层	明显。
4. 韧皮部束	有31~135个，与木质部束相间排列。
5. 木质部束	有31~135个，与韧皮部束相间排列，少数导管深入髓部。
6. 髓部	薄壁细胞亦含草酸钙针晶束。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells	Numerous, mostly singly scattered; pale yellowish-brown or nearly colorless; strip-shaped, long eliptical or subrounded; thickened walls; pits and pit canals extremely fine and dense, easily broken.
2. Raphides of calcium oxalate	Mostly in bundles or scattered. Brightly orange in color separated by polychrome observed under a polarizing microscope.
3. Fibre tracheids	Relatively long, ends slightly oblique or obliquely sharp; with relatively thickened walls; bordered pits distinct, pits long cleft-shaped; beyond the border of pits.

图注

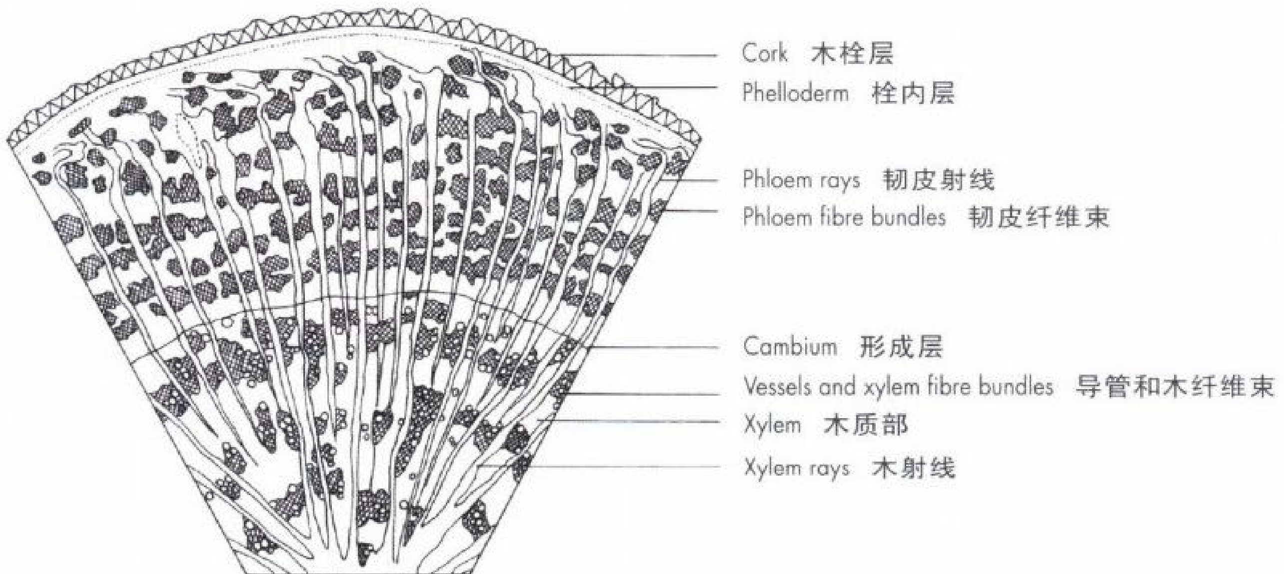
1. 石细胞	甚多，多单个散在，淡黄棕色或近无色，呈长条形、长椭圆形或类圆形，壁厚，纹孔及孔沟极细密，易破碎。
2. 草酸钙针晶	多成束或散在。偏光显微镜下呈亮橙黄色间多彩状。
3. 纤维管胞	较长，末端稍倾斜或斜尖。壁稍厚，具缘纹孔明显，纹孔长裂纹状，超出纹孔缘。



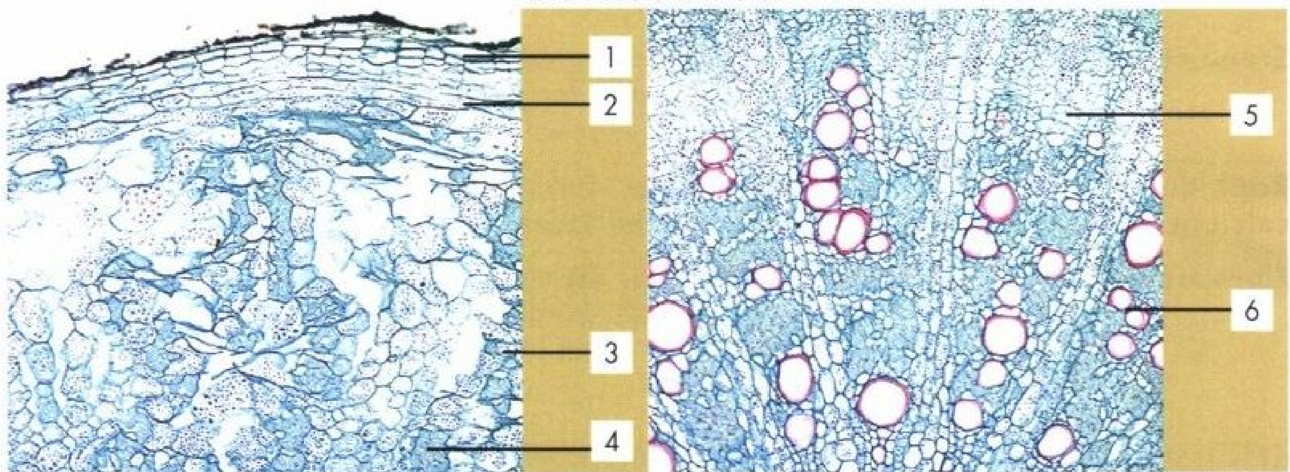
黄芪 Huangqi

The dried root of *Astragalus membranaceus* (Fisch.) Bge. var. *mongholicus* (Bge.) Hsiao. (Fam. Leguminosae).
豆科植物蒙古黄芪的干燥根。

Sketch of transverse section of root 根横切面简图



Transverse section of root 根横切面组织图



100μm

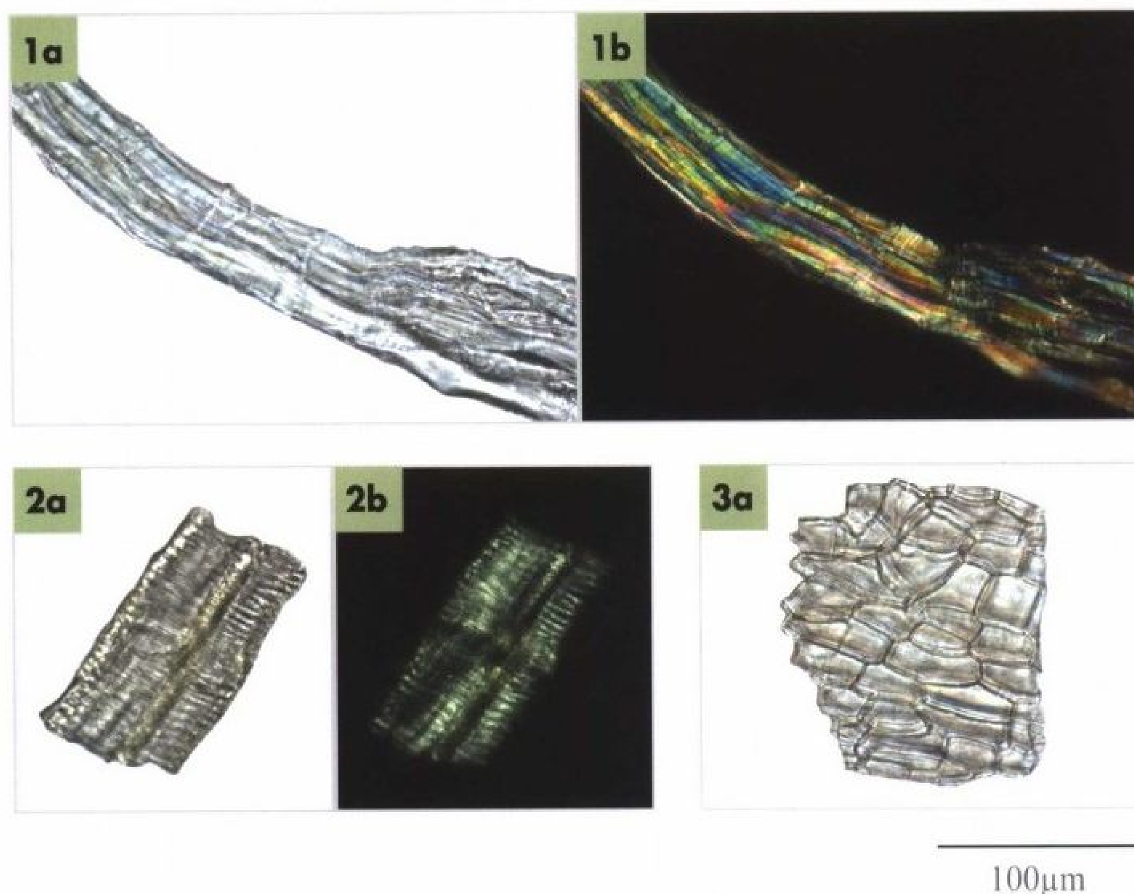
Transverse section of root

1. Cork	Several rows of cork cells.
2. Phelloderm	Consisting of 3~5 rows of collenchymatous cells.
3. Phloem	Outer side of rays usually curved, with clefts; fibre bundles and sieve tube groups arranged alternately; stone cells near the phelloderm.
4. Fibres	In bundles, with thickened walls, lignified or slightly lignified.
5. Cambium	In a ring.
6. Xylem	Vessels singly scattered or 2~3 aggregated in groups; xylem fibres existing among vessels, sometimes stone cells singly or 2~4 in groups in the rays visible.
Parenchymatous cells	Containing starch granules.

根横切面组织图注

1. 木栓层	细胞多列。
2. 栓内层	为3~5列厚角细胞。
3. 韧皮部	射线外侧常弯曲，有裂隙，纤维束与筛管群交互排列，近栓内层处可见石细胞。
4. 纤维	成束，壁厚，木化或微木化。
5. 形成层	成环。
6. 木质部	导管单个散在或2~3个相聚，导管间有木纤维，射线中有时可见单个或2~4个成群的石细胞。
薄壁细胞	含淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibres	Abundant, in bundles or scattered, thick walls, with longitudinal fissures on the surface, the primary walls often separated from the secondary walls; both ends often broken to tassel-like or slightly truncated. Brightly orange separated by polychrome and spiral stiations observed under a polarizing microscope.
2. Vessels	Mainly bordered pitted vessels; colorless or pale yellowish-green, bordered pits arrangeg densely. Brightly yellow in color observed under a polarizing microscope.
3. Cork cells	Subpolygonal or subrectangular on the surface view, walls slightly undulantly curved.

图注

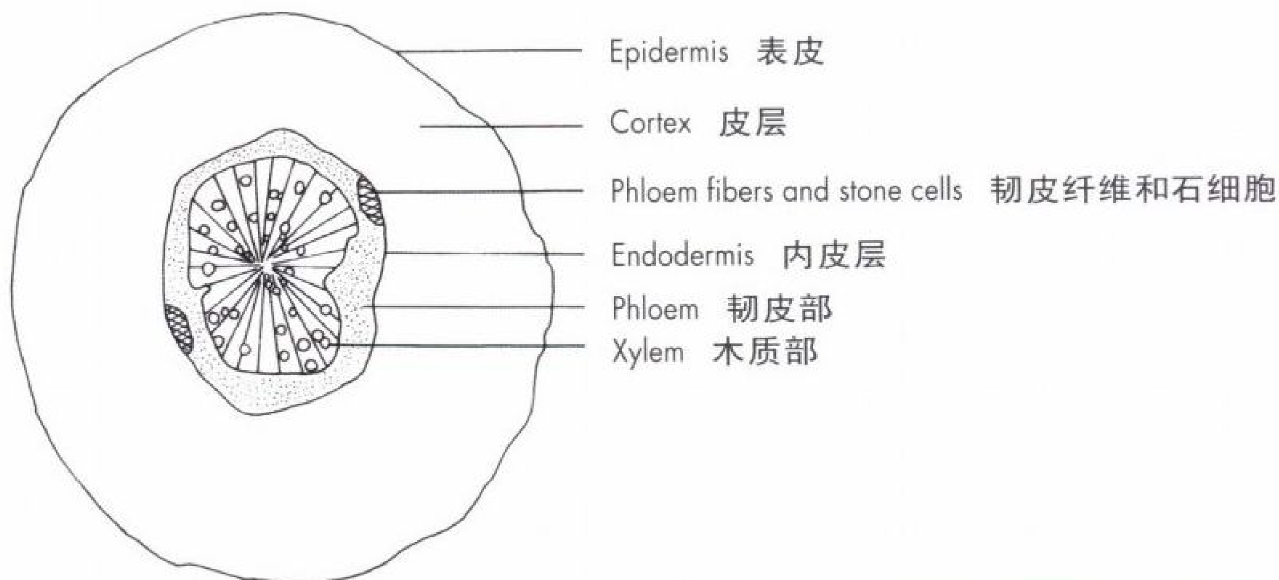
1. 纤维	较多，成束或散离，壁厚，表面有纵裂纹，初生壁常与次生壁分离，两端常断裂呈须状，或较平截。偏光显微镜下呈亮橙黄色间多彩状，表面可见螺纹。
2. 导管	主为具缘纹孔导管，无色或淡黄绿色，具缘纹孔排列紧密。偏光显微镜下呈亮黄色。
3. 木栓细胞	表面观呈类多角形或类方形，壁微波状弯曲。

威灵仙 Weilingxian

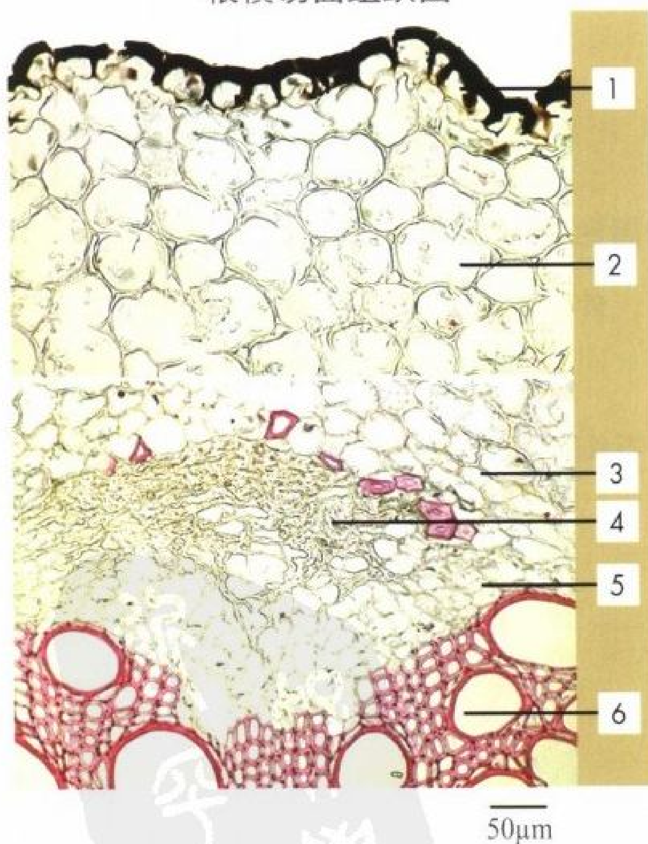


The dried root of *Clematis chinensis* Osbeck (Fam. Ranunculaceae).
毛茛科植物威灵仙的干燥根。

Sketch of transverse section of root
根横切面组织图



Transverse section of root
根横切面组织图



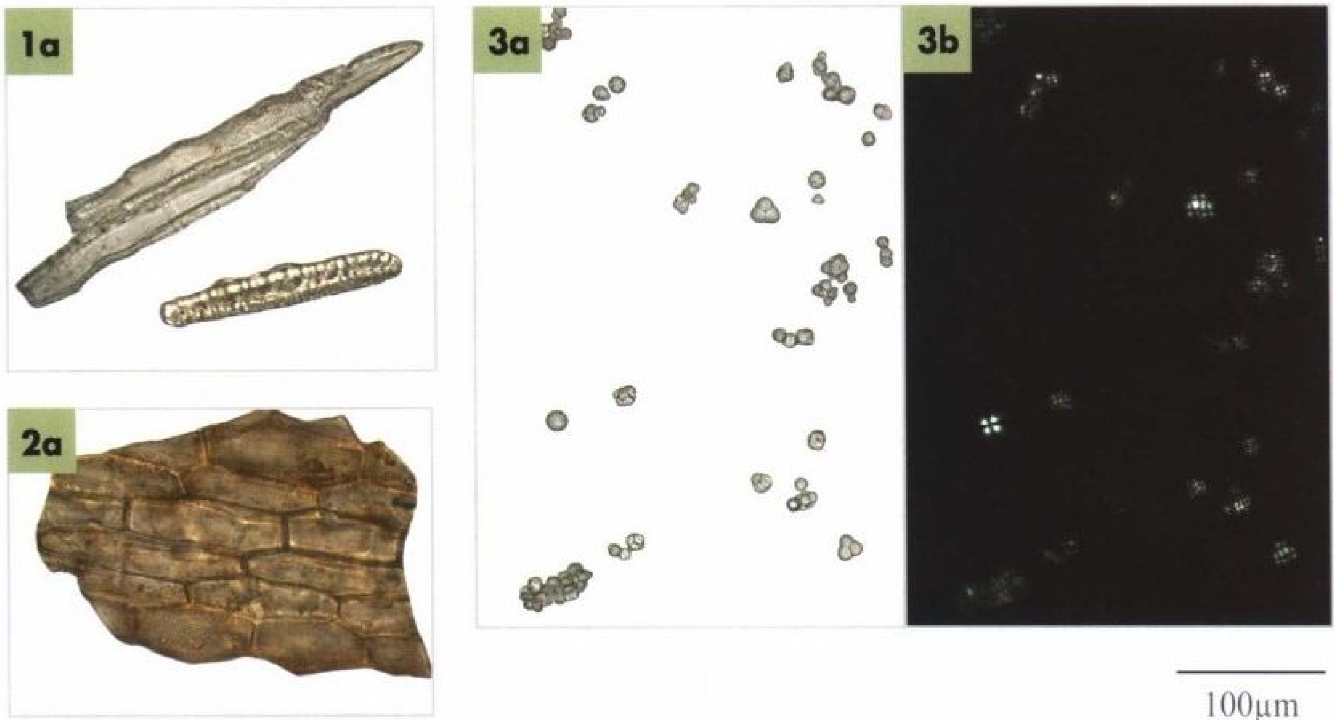
Transverse section of root

1. Epidermis	Outer cell walls thickened, brownish-black.
2. Cortex	Broad, consisting of parenchymatous cells, exodermis elongated tangentially.
3. Endodermis	Distinct.
4. Phloem	Outer side of phloem usually showing fibre bundles and stone cells, fibres 18~43μm in diameter.
5. Cambium	Distinct.
6. Xylem	Completely lignified
Parenchymatous cells	Containing starch granules.

根横切面组织图注

1. 表皮	细胞外壁增厚，棕黑色。
2. 皮层	宽，均为薄壁细胞，外皮层切向延长。
3. 内皮层	明显。
4. 韧皮部	外侧常有纤维束及石细胞，纤维直径18~43μm。
5. 形成层	明显。
6. 木质部	全部木化。
薄壁细胞	含淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibres	Present in bundles or singly dispersed, yellow; long fusiform, the endings tapering, rarely branched; 13~61μm in diameter, 79~417μm long; the walls lignified and 3~17μm thick; with oblique or cruciate pits sparsely present, pit canals densely arranged.
2. Epidermal cells	Subsquare on the surface view, 22~53μm in diameter; outer periclinal walls dark brown and granular.
3. Starch granules	Abundant. Simple granules subrounded, hilum dotted; compound granules numerous, composed of 2~6 components. Black cruciate shape could be observed under a polarizing microscope.

图注

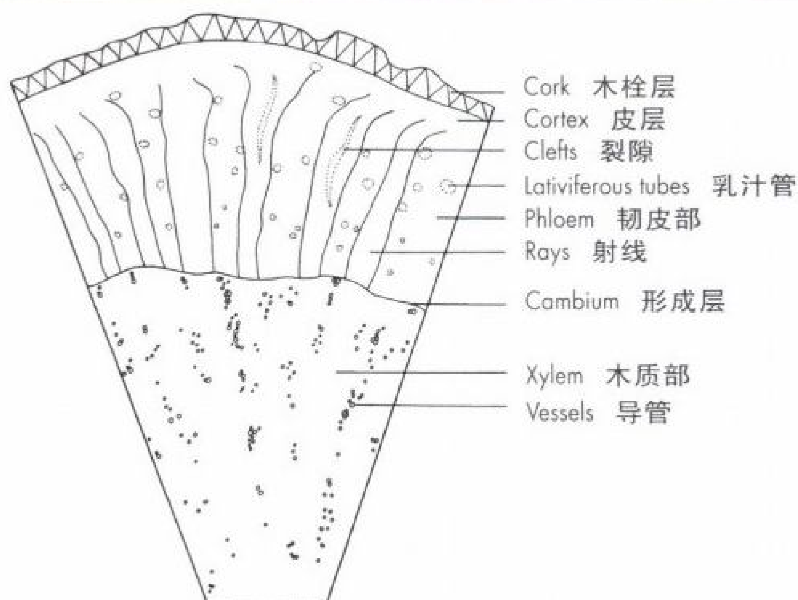
1. 纤维	成束或单个散在，黄色。长梭形，末端渐尖，稀有分叉，直径13~61μm，长79~417μm，壁厚3~17μm，木化，具稀疏斜纹孔或十字纹孔对，孔沟较密。
2. 表皮细胞	表面观类方形，直径22~53μm，外平周壁深棕色，显颗粒状。
3. 淀粉粒	众多。单粒类圆形，脐点点状；复粒较多，由2~6分粒组成。偏光下可见黑十字现象。

党参 Dangshen

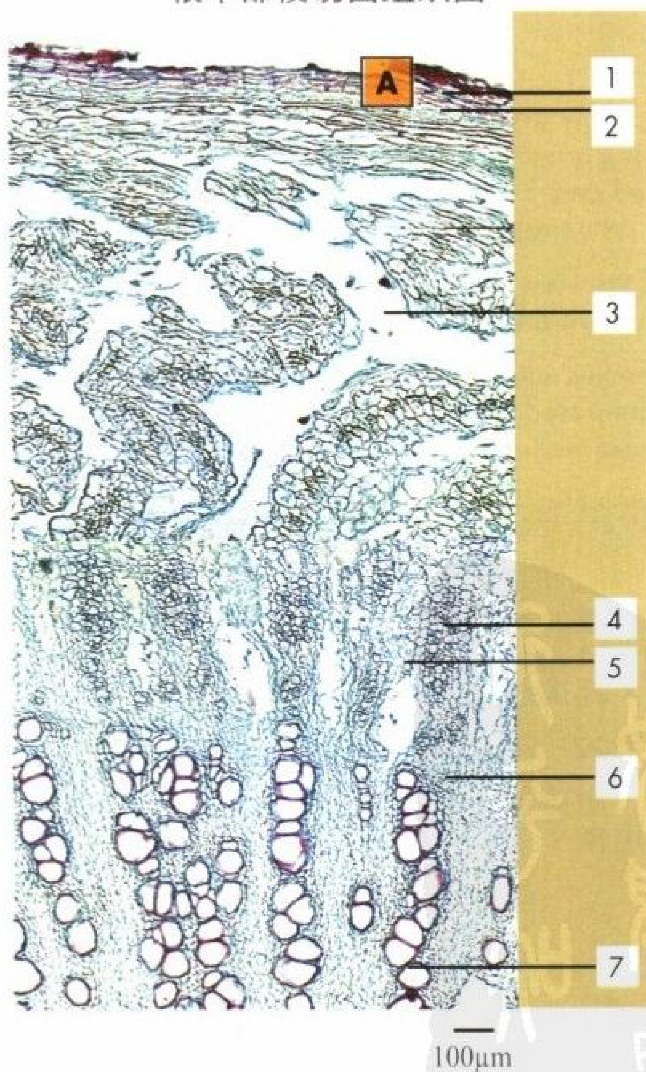


The dried root of *Codonopsis pilosula* (Franch.) Nannf. (Fam. Campanulaceae).
桔梗科植物党参的干燥根。

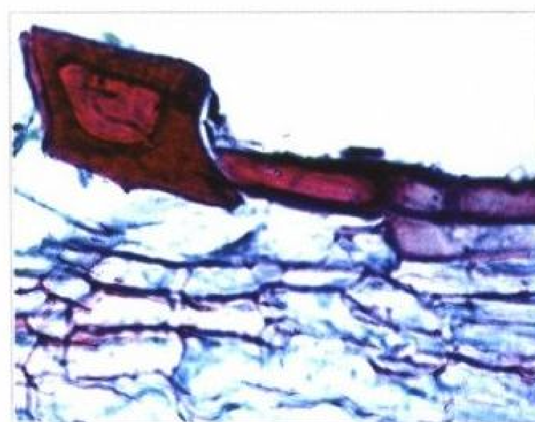
Sketch of transverse section of root
根横切面简图



Transverse section of middle part of root
根中部横切面组织图



A Stone cells
石细胞



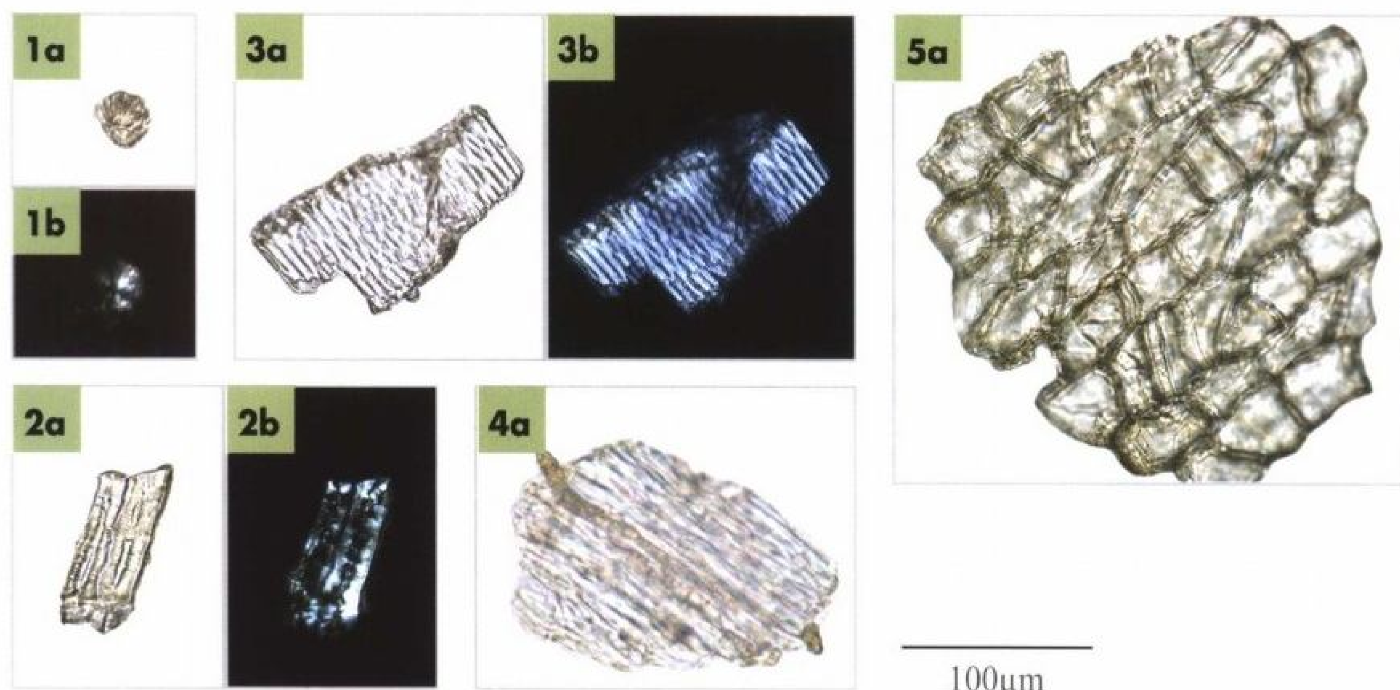
Transverse section of root

1. Cork	Several up to over 10 rows of cells, showing stone cells at the outer side, singly or grouped.
2. Cortex	Narrow.
3. Clefts	Frequently in the outer part of phloem.
4. Phloem	Broad, usually with clefts at the outer side, scattered with thin-yellow laticiferous vessel groups, and arranged alternately with sieve tubes.
5. Ray	3~7 rows of cells in width.
6. Cambium	In a ring.
7. Xylem	Vessels singly scattered or several grouped, arranged radially.
Parenchymatous Cells	Containing inulin.

根横切面组织图注

1. 木栓层	数列至10数列细胞，外侧有石细胞，单个或成群。
2. 皮层	窄。
3. 裂隙	韧皮部外侧常见。
4. 韧皮部	宽广，外侧常现裂隙，散有淡黄色乳管群，并常与筛管群交互排列。
5. 射线	3~7列细胞宽。
6. 形成层	成环。
7. 木质部	导管单个散在或数个相聚，呈放射状排列。
薄壁细胞	含菊糖。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Inulin	Masses scattered, fan-shaped, radial lines observed in surface. Visible under a polarizing microscope.
2. Stone Cells	Abundent, pale yellowish color, singly scattered or several grouped. Polygonal, rhombic, rectangular or short fusiform, mostly with sharp cusp at one end or one side, or slightly branched, occasionally like short fibres, pits sparse, pit canals distinct. Visible under a polarizing microscope.
3. Vessels	Bordered pitted, reticulate and reticulate bordered pitted vessels, occasionally scalariform vessels, vessel elements relatively short.
4. Laticiferous tubes	Articulate laticiferous tubes, lumina of laticiferous tubes and surrounding cells full of pale yellow oil droplets and fine granules.
5. Cork Cells	Subpolygonal on the surface view, anticlinal walls thin and slightly curved.

图注

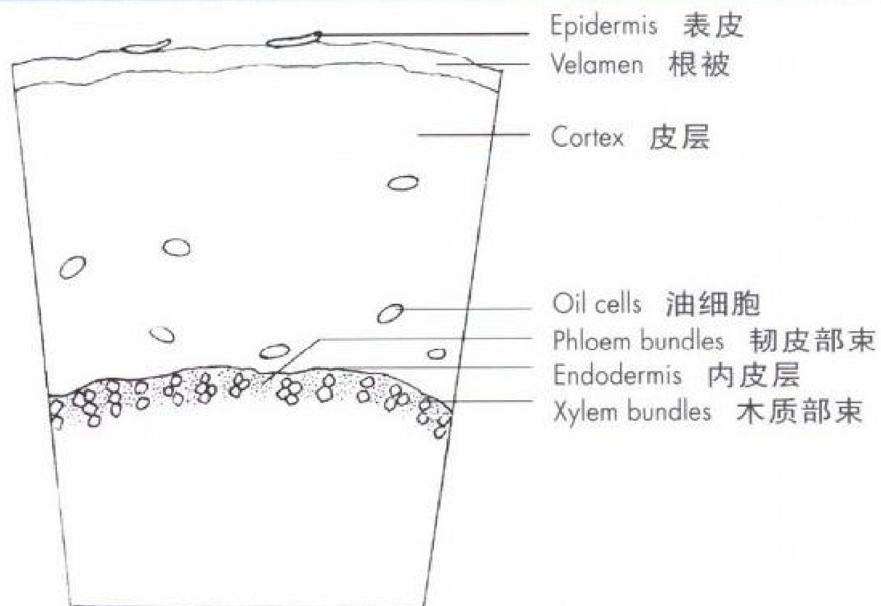
1. 菊糖	团块散在，呈扇形，表面呈现放射状线纹。偏光显微镜下可见。
2. 石细胞	较多，淡黄色，单个散在或数个成群。呈多角形、类斜方形、长方形或短梭形，大多一端或一边尖突，或略呈分枝状，偶有呈短纤维状，纹孔稀疏，孔沟明显。偏光显微镜下可见。
3. 导管	具缘纹孔、网纹及网状具缘纹孔导管，偶有梯纹导管，导管分子较短。
4. 乳汁管	为有节联结乳汁管，乳汁管内及周围细胞中充满淡黄色油滴状物及细颗粒状物。
5. 木栓细胞	表面观呈类多角形，垂周壁薄，微弯曲。



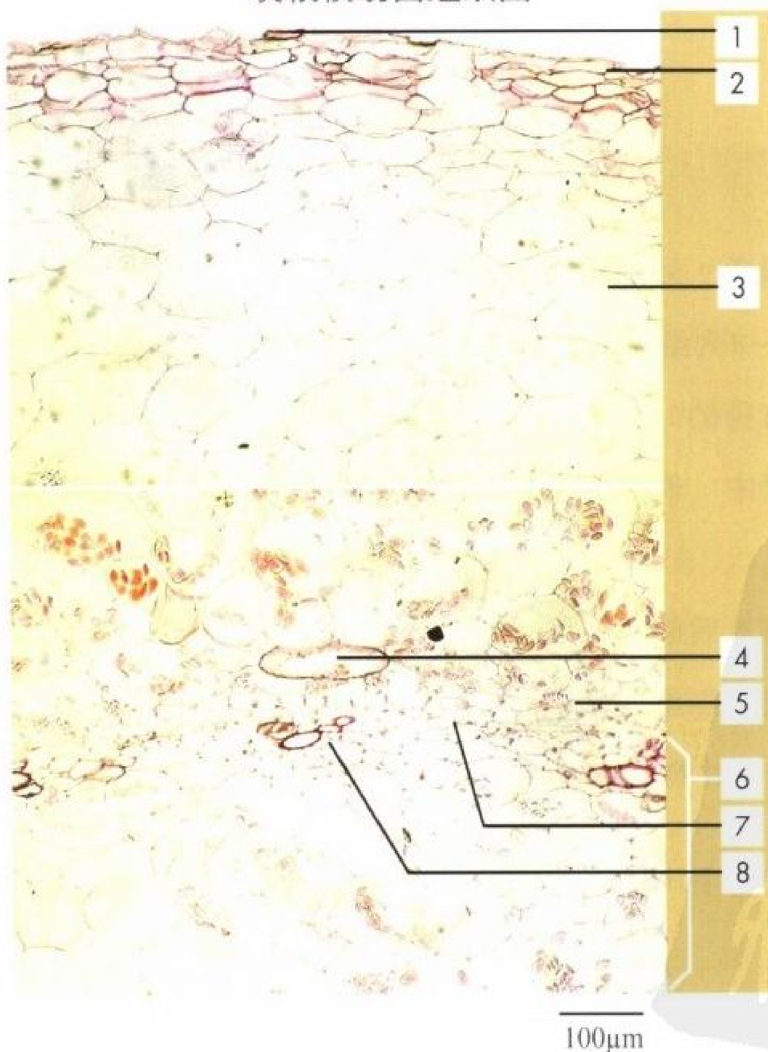
郁金 Yujin

The dried root tuber of *Curcuma wenyujin* Y. H.Chen et C. Ling. (Fam. Zingiberaceae).
姜科植物温郁金的干燥块根。

Sketch of transverse section of root tuber
块根横切面简图



Transverse section of root tuber
块根横切面组织图



Transverse section of root tuber

1. Epidermis	Sometimes cells remained, the outer walls slightly thickened.
2. Velamen	Narrow, consisting of 4~8 rows of cells; with sinuous and thin walls, regularly arranged.
3. Cortex	1/2 as wide as the diameter of the root.
4. Oil cells	Scattered in cortex, occasionally observed.
5. Endodermis	Distinct.
6. Stele	Phloem bundles and xylem bundles 40~55 respectively.
7. Phloem bundles	Arranged alternatively with xylem bundles.
8. Xylem bundles	2~4 Vessels, and with slightly lignified fibres; vessels polygonal, thin walls, 20~90μm in diameter.
Starch granules	In parenchymatous cells, all gelatinized.

块根横切面组织图注

1. 表皮	细胞有时残存，外壁稍厚。
2. 根被	狭窄，为4~8列细胞，壁薄，略呈波状，排列整齐。
3. 皮层	宽约为根直径的1/2。
4. 油细胞	散在于皮层中，偶见。
5. 内皮层	明显。
6. 中柱	韧皮部束与木质部束各40~55个。
7. 韧皮部束	与木质部束间隔排列。
8. 木质部束	导管2~4个，并有微木化的纤维，导管多角形，壁薄，直径20~90μm。
淀粉粒	位于薄壁细胞中，均糊化。

Main Powder Characteristics
主要粉末显微特征







100μm

Notes

1. Parenchyma cells containing aleurone granules	Abundant if mounting in water and dilute glycerin. Present singly or several in clumps, round or oblong polyhedron in outline.
2. Vessels	Few; mainly scalariform and reticulate in type.
3. Oil cells	Rare, subrounded or oblong, containing pale yellow or golden-yellow oil droplets or secretions.

图注

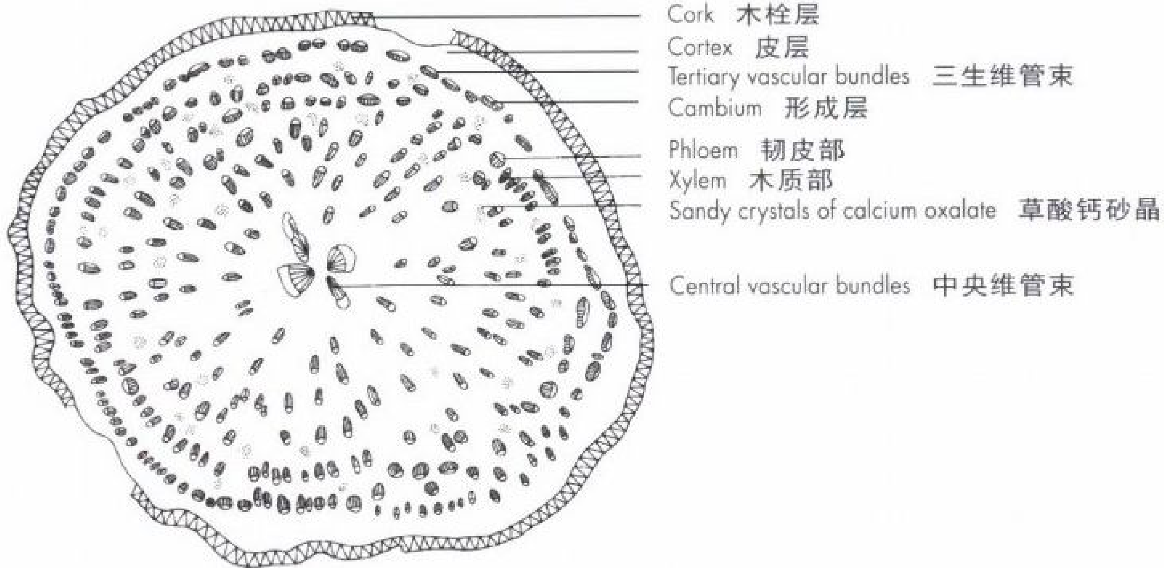
1. 含糊化淀粉粒的薄壁细胞	以水及稀甘油装片观察可见含糊化淀粉粒的薄壁细胞，极多。单个散在或数个成块，呈圆形或长圆形的多面体状。
2. 导管	较少。以梯纹及网纹为多。
3. 油细胞	稀少。类圆形或长圆形，内含浅黄色或金黄色油滴及分泌物。

川牛膝 Chuanniuxi

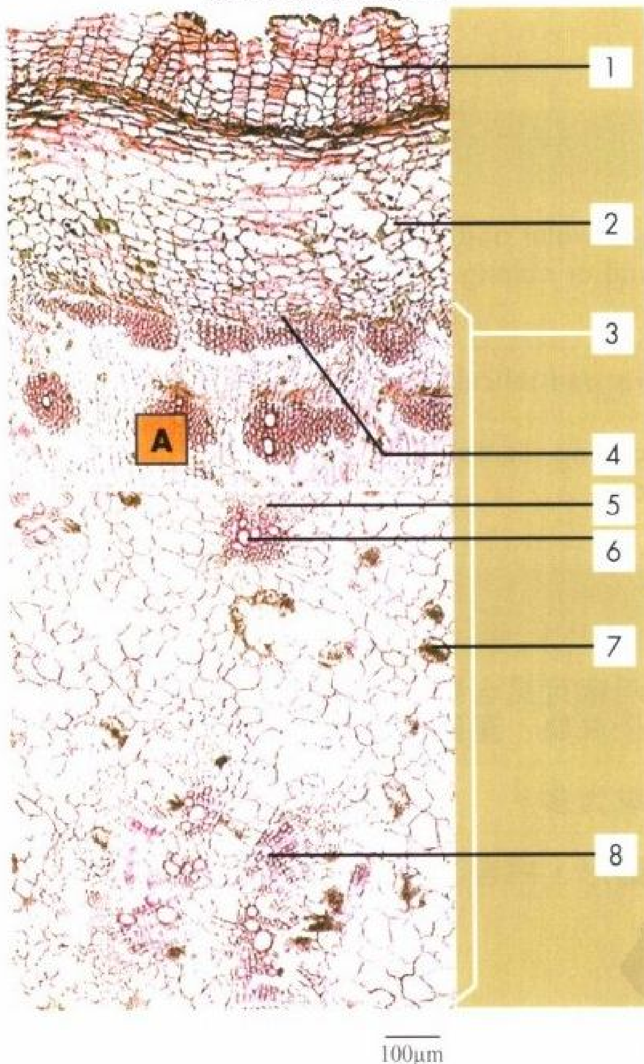


The dried root of *Cyathula officinalis* Kuan (Fam. Amaranthaceae).
苋科植物川牛膝的干燥根。

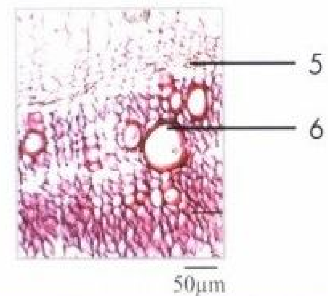
Sketch of transverse section of root
根横切面组织简图



Transverse section of root
根横切面组织图



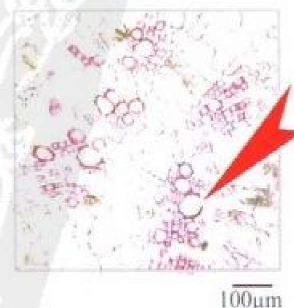
A Vascular bundle
维管束



Cells containing sandy crystals of calcium oxalate
含有草酸钙砂晶的细胞



Central vascular bundles
中央维管束



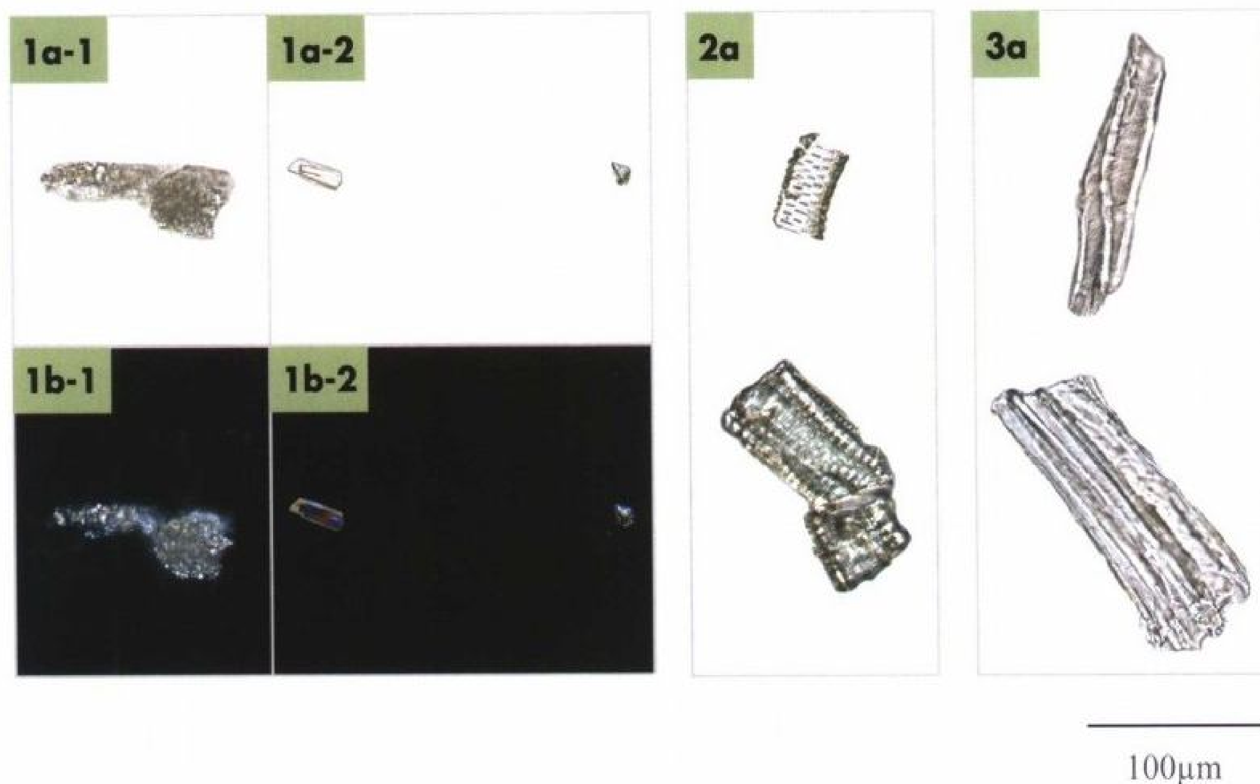
Transverse section of root

1. Cork	Consisting of several rows of cork cells.
2. Cortex	Relatively narrow.
3. Stele	Large; tertiary vascular bundles collateral; interruptedly arranged in 4~11 whorls.
4. Cambium	Consisting of several rows of parenchymatous cells; intrafascicular cambium visible.
5. Phloem	Outer part of vascular bundles.
6. Xylem	Most vessels singly; arranged radially and lignified. Xylem fibres relatively developed; sometimes tangentially elongated or arranged in an interrupted ring.
7. Sandy crystals of calcium oxalate	Distributing in some parenchymatous cells.
8. Central vascular bundles	Usually separated into 2~9 bundles.

根横切面组织图注

1. 木栓层	为数列木栓细胞。
2. 皮层	较窄。
3. 中柱	大，三生维管束外韧型，断续排列成4~11轮。
4. 形成层	由数列薄壁细胞组成；束中形成层易见。
5. 韧皮部	位于维管束外侧。
6. 木质部	导管多单个，常径向排列，木化；木纤维较发达，有的切向延长或断续连接成环。
7. 草酸钙砂晶	分布于部分薄壁细胞内。
8. 中央维管束	常分成2~9束。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Crystals of calcium oxalate	Sandy crystals and prisms scattered or full in parenchymatous cells. Brightly yellowish-white in color observed under a polarizing microscope.
2. Vessels	Mainly bordered pitted vessels; 10~80μm in diameter; pits rounded or transversely elongated pits long rounded; alternate and arranged densely; some vessels fusiform.
3. Fibres	Strip-shaped; curved with tapered end; 8~25μm in diameter; walls 3~5μm thick; pits oblique or V-shaped; bordered pits observed; pit apertures crossed in cruciate shape; pit canals distinct with different spacing.

图注

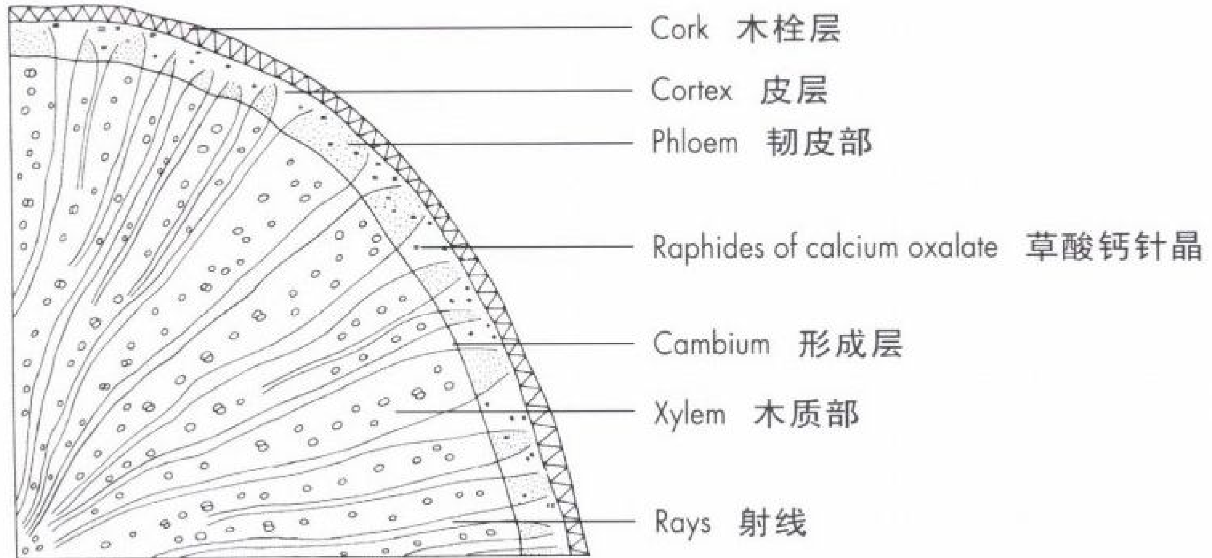
1. 草酸钙结晶	砂晶、方晶散在或充塞于薄壁细胞中。偏光显微镜下呈亮黄白色。
2. 导管	主为具缘纹孔导管，直径10~80μm，纹孔圆形或横向延长成长圆形，互列，排列紧密，有的导管呈梭形。
3. 纤维	长条形，弯曲，末端渐尖，直径8~25μm，壁厚3~5μm，纹孔呈斜纹孔或人字形，也可见具缘纹孔，纹孔口交叉呈十字形，孔沟明显，疏密不一。

常山 Changshan

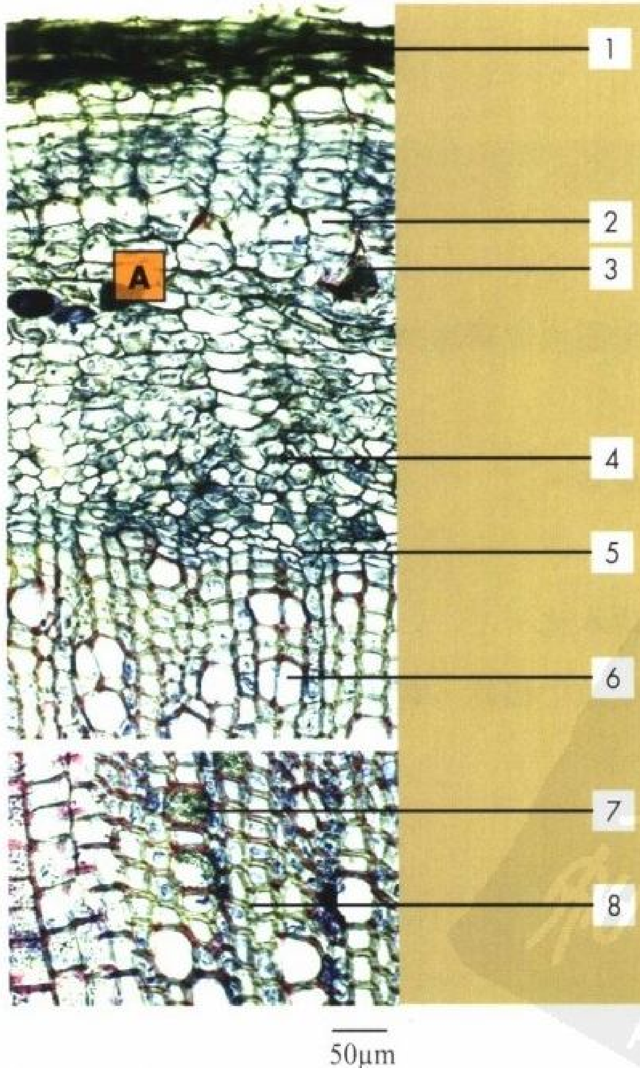


The dried root of *Dichroa febrifuga* Lour. (Fam. Saxifragaceae).
虎耳草科植物常山的干燥根。

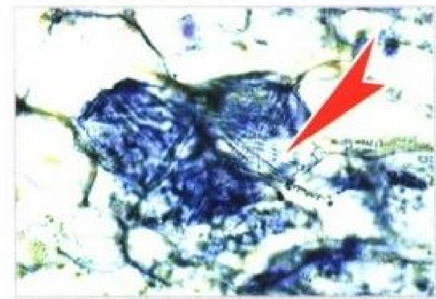
Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



A Raphides of calcium oxalate
草酸钙针晶



Transverse section of root

1. Cork	Several rows of cells.
2. Cortex	Narrow, few cells containing resinous masses or raphides of calcium oxalate.
3. Raphides of calcium oxalate	Scattered or aggregated in bundles.
4. Phloem	Narrow, containing numerous raphides of calcium oxalate.
5. Cambium	Forming a ring.
6. Xylem	Occupying the main part of the root, all cells lignified.
7. Vessels	Polygonal, singly scattered or several aggregated, some containing yellow tylosis.
8. Rays	Varying in width.
Parenchymatous cells	Containing starch granules.

根横切面的组织图注

1. 木栓层	数列细胞。
2. 皮层	窄，少数细胞内含树脂块或草酸钙针晶束。
3. 草酸钙针晶	散在或成束。
4. 韧皮部	较窄，草酸钙针晶束多。
5. 形成层	成环。
6. 木质部	占主要部分，细胞均木化。
7. 导管	多角形，单个散在或数个相聚，有的含黄色侵填体。
8. 射线	宽窄不一。
薄壁细胞	含淀粉粒。

Main Powder Characteristics
主要粉末显微特征


1a


2a


2b


3a


4a

100μm

Notes

1. Cork cells	Pale yellow, rectangular or subsquare.
2. Raphides of calcium oxalate	In bundles or single scattered. Brightly orange in colour separated by polychrome observed under a polarizing microscope.
3. Scalariform vessels	Single scattered or several grouped, usually adhering to fibres.
4. Xylem fibres	Severaly or singly scattered.

图注

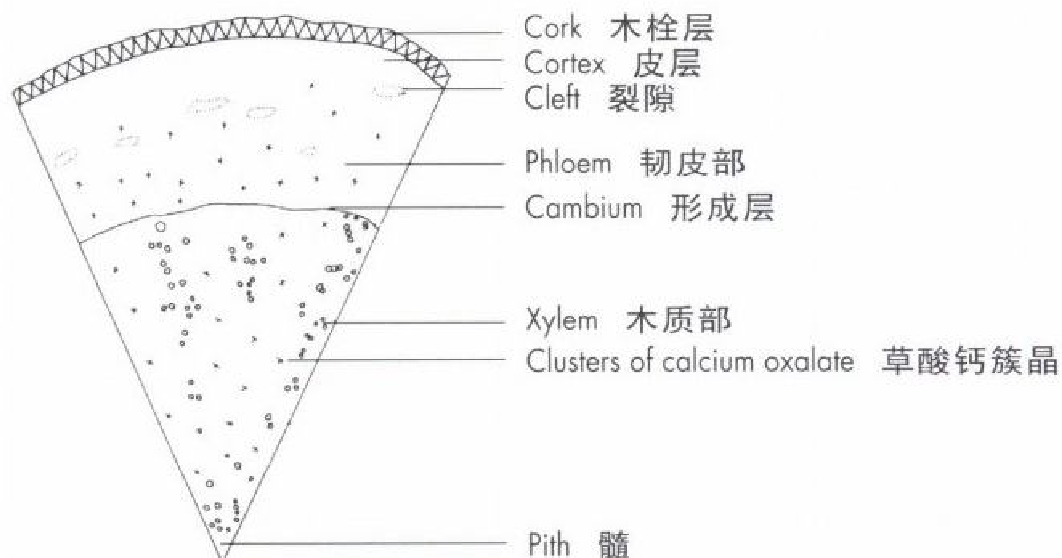
1. 木栓细胞	淡黄色，长方形或类方形。
2. 草酸钙针晶	成束或单个散在。偏光显微镜下呈亮橙黄色间多彩状。
3. 梯纹导管	单个散在或数个相聚，常与纤维相连。
4. 木纤维	数个或单个散在。

续断 Xuduan

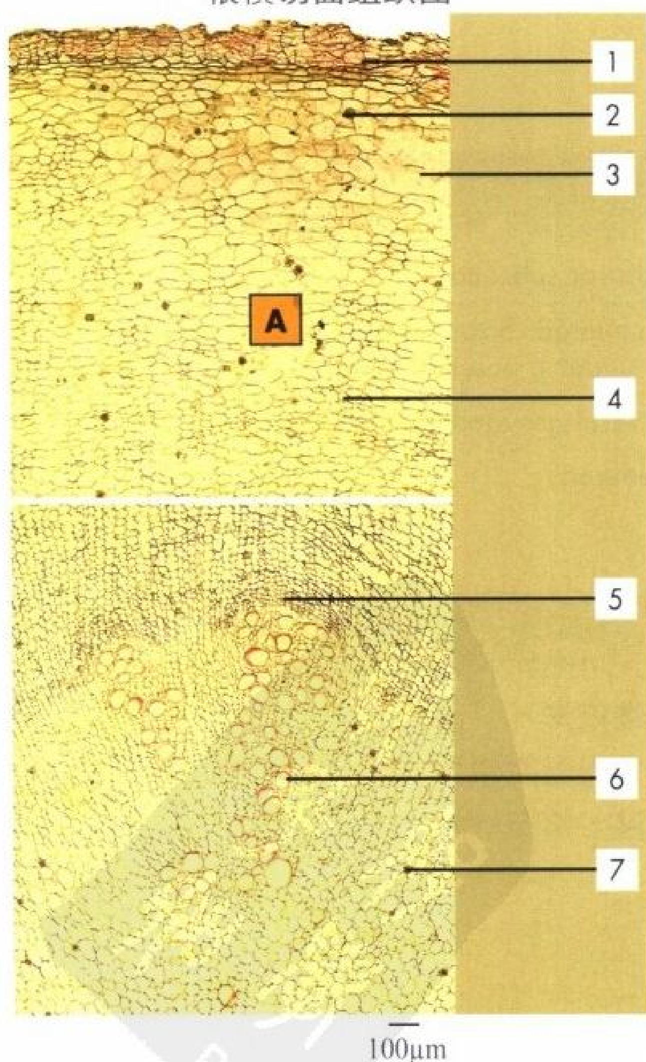


The dried root of *Dipsacus asperoides* C.Y.Cheng et T.M.Ai (Fam. Dipsacaceae).
川续断科植物川续断的干燥根。

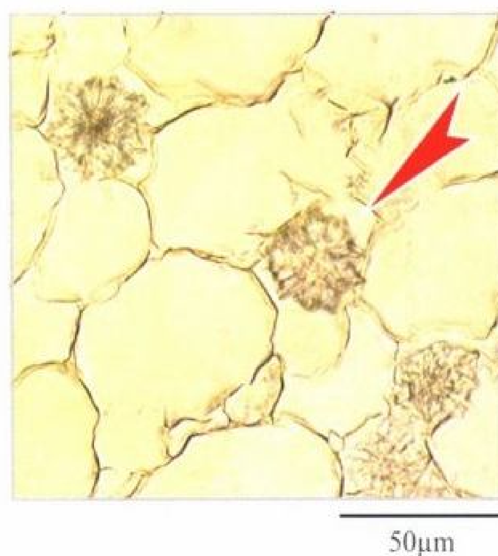
Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



Clusters of calcium oxalate
草酸钙簇晶



Transverse section of root

1. Cork cells	Several rows, pale brown in color.
2. Cortex	Relatively narrow.
3. Clefts	Correspondingly small, easily observed.
4. Phloem	Sieve tubes sparsely scattered.
5. Cambium ring	In the form of a ring, distinct or indistinct.
6. Xylem	Rays broad, vessels dense near the cambium gradually sparse towards inner part, usually single separated or 2~4 in group.
7. Clusters of calcium oxalate	Existing in parenchymatous cells.
Pith	Small, most fine roots without pith.

根横切面组织图注

1. 木栓细胞	数列，浅棕色。
2. 皮层	较窄。
3. 裂隙	较小，易见。
4. 韧皮部	筛管群稀疏散在。
5. 形成层	环状，明显或不甚明显。
6. 木质部	射线宽广，导管近形成层处分布较密，向内渐稀少，常单个散在或2~4个相聚。
7. 草酸钙簇晶	存在于薄壁组织中。
髓部	小，细根多无髓。

Main Powder Characteristics
主要粉末显微特征









100μm

Notes

1. Clusters of calcium oxalate	Numerous, scattered or in shrinked parenchymatous cells. Polychromatic color observed under a polarizing microscope.
2. Parenchymatous cells	Fusiform, with slightly thickened walls, and obliquely crossed fine texture.
3. Vessels	Bordered, pitted and reticulate vessels, 72~90μm in diameter.

图注

1. 草酸钙簇晶	甚多，散在或存在于皱缩的壁细胞中，偏光显微镜下结晶呈多彩色。
2. 薄壁细胞	纺锤形，壁稍厚，有斜向交错的细纹理。
3. 导管	具缘纹孔及网纹导管，直径72~90μm。

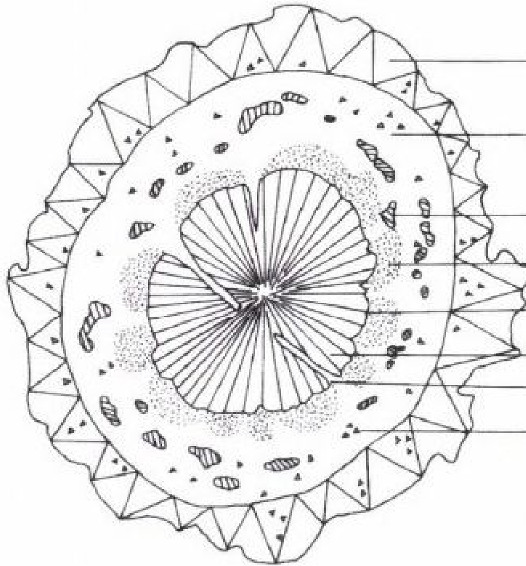
Radix et Rhizoma Ephedrae



麻黄根 Mahuanggen

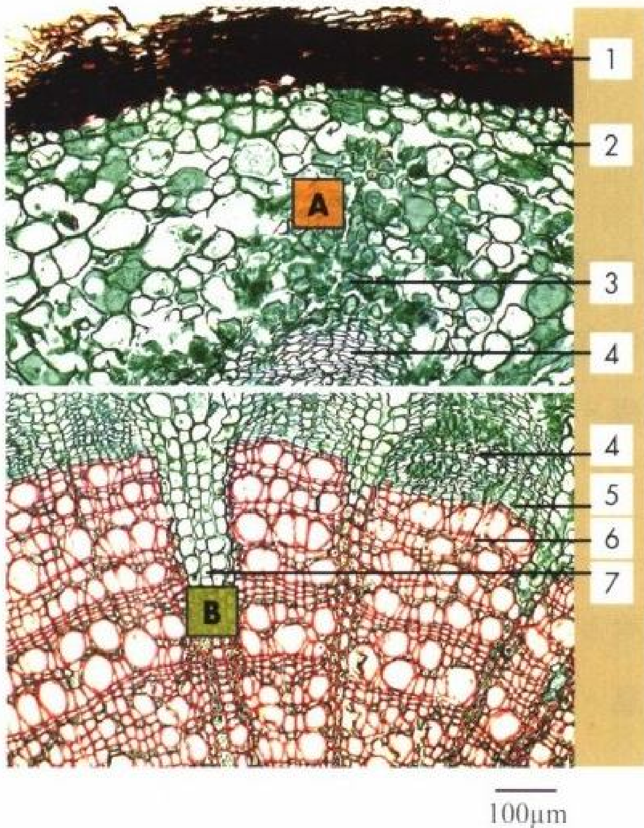
The dried root and rhizome of *Ephedra sinica* Stapf (Fam. Ephedraceae).
麻黄科植物草麻黄的干燥根和根茎。

Sketch of transverse section of root
根横切面组织简图



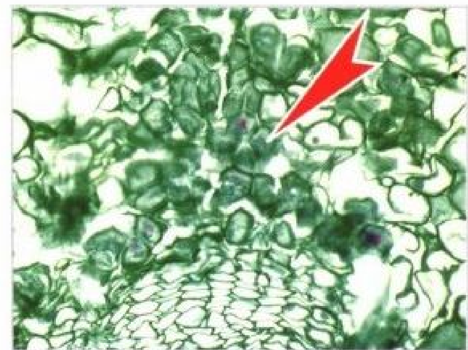
Cork 木栓层
Cortex 皮层
Pericycle (composed of fibres and stone cells)
中柱鞘（由纤维和石细胞组成）
Phloem 韧皮部
Cambium 形成层
Xylem 木质部
Rays 射线
Sandy crystals of calcium oxalate 草酸钙砂晶

Transverse section of root
根横切面组织图



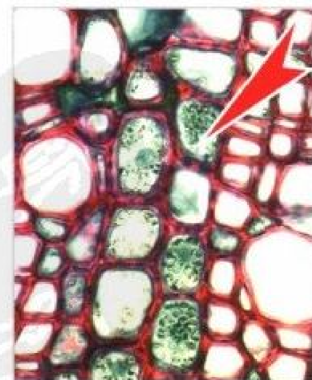
100μm

A *Pericycle*
中柱鞘



50μm

B *Cells of rays containing sandy crystals of calcium oxalate*
射线细胞含有草酸钙砂晶



50μm

Transverse section of root

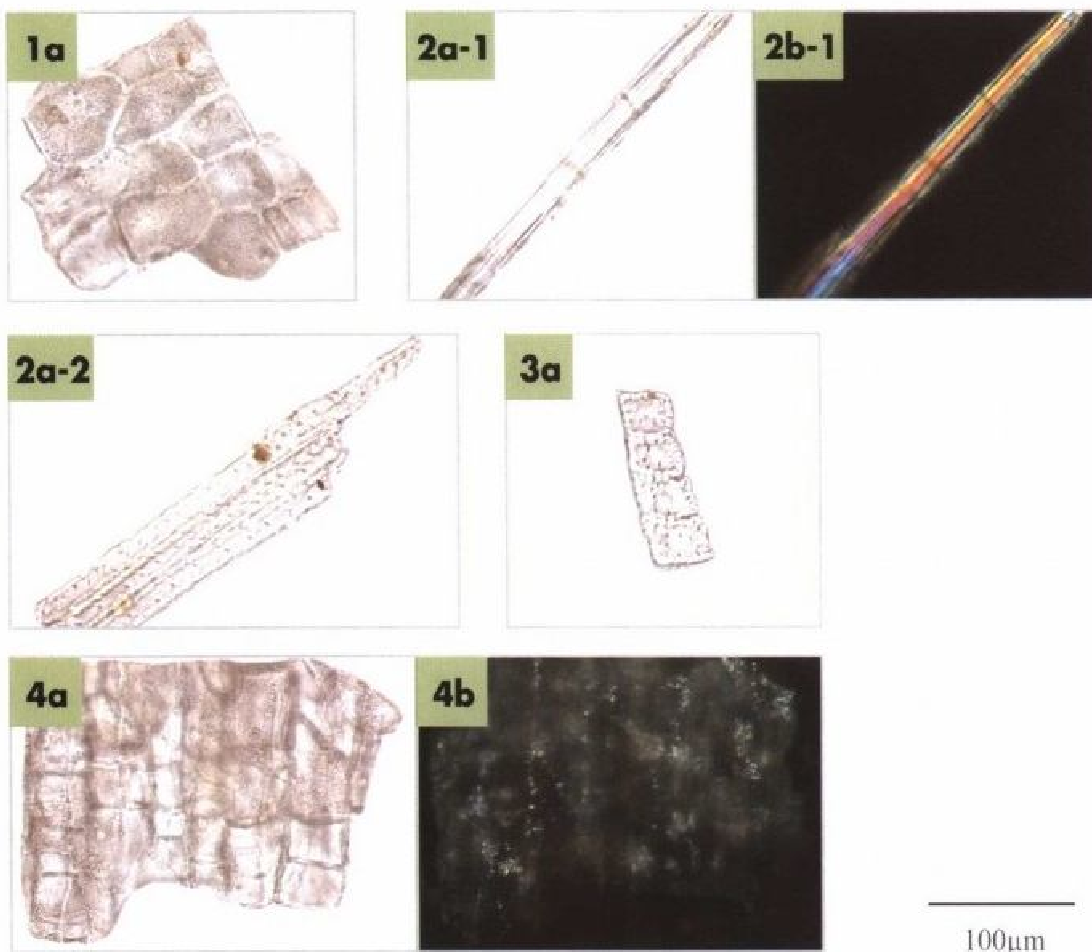
1. Cork	More than 10 rows of cells, rhytidomes occurring at the outside of cork.
2. Cortex	Consisting of several rows of parenchymatous cells, containing sandy crystals of calcium oxalate.
3. Pericycle	Composed of fibres and stone cells.
4. Phloem	Narrow.
5. Cambium	In a ring.
6. Xylem	Developed; consisting of vessels, tracheids and xylem fibres.
7. Rays	Broad; with sandy crystals of calcium oxalate.

根横切面组织图注

1. 木栓	10余列细胞，其外有落皮层。
2. 皮层	为数列薄壁细胞，含草酸钙砂晶。
3. 中柱鞘	由纤维及石细胞组成。
4. 韧皮部	窄。
5. 形成层	成环。
6. 木质部	发达，由导管、管胞及木纤维组成。
7. 射线	宽广，含草酸钙砂晶。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Cork cells	Pale yellowish-brown; rectangular.
2. Fibres	Mostly singly scattered or several grouped; 20~25μm in diameter. Phloem fibres (2a-1): walls extremely thickened. Bright polychrome in color under a polarizing microscope. Xylem fibres (2a-2): mostly in bundles, walls thickened and lignified; oblique pits distinct.
3. Stone cells	Longrounded; subfibred or branched; 20~50μm in diameter; with thick walls.
4. Sandy crystals of calcium oxalate	Fine; consisting in parenchymatous cells. Brightly yellowish-white color observed under a polarizing microscope.

图注

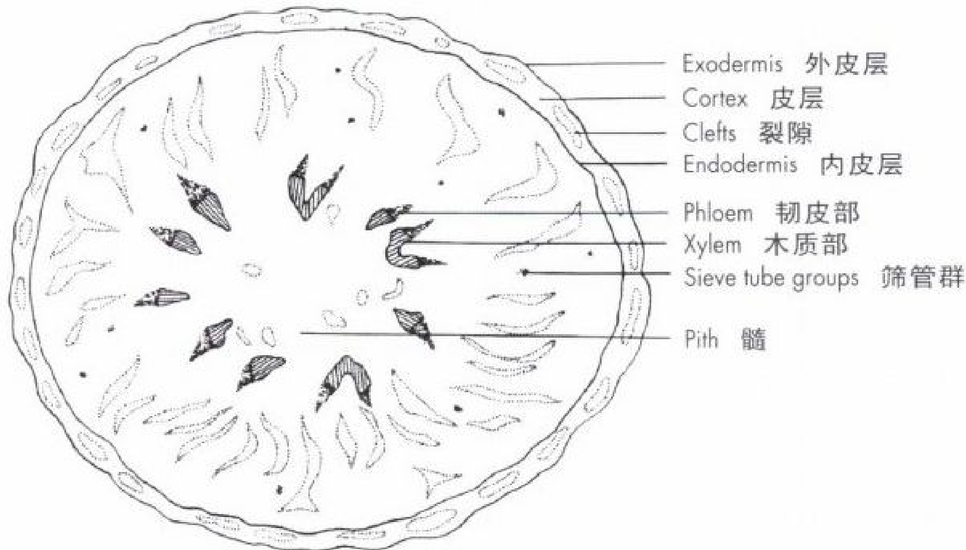
1. 木栓细胞	淡黄棕色，呈长方形。
2. 纤维	多单个散在或数个相聚，直径20~25μm。皮部纤维(2a-1)：壁极厚，偏光下呈明显多彩色；木纤维(2a-2)：多成束，壁增厚，木化，斜纹孔明显。
3. 石细胞	呈长圆形，类纤维状或有分枝，直径20~50μm，壁厚。
4. 草酸钙砂晶	细小，存在于薄壁细胞中。偏光显微镜下结晶呈亮黄白色。



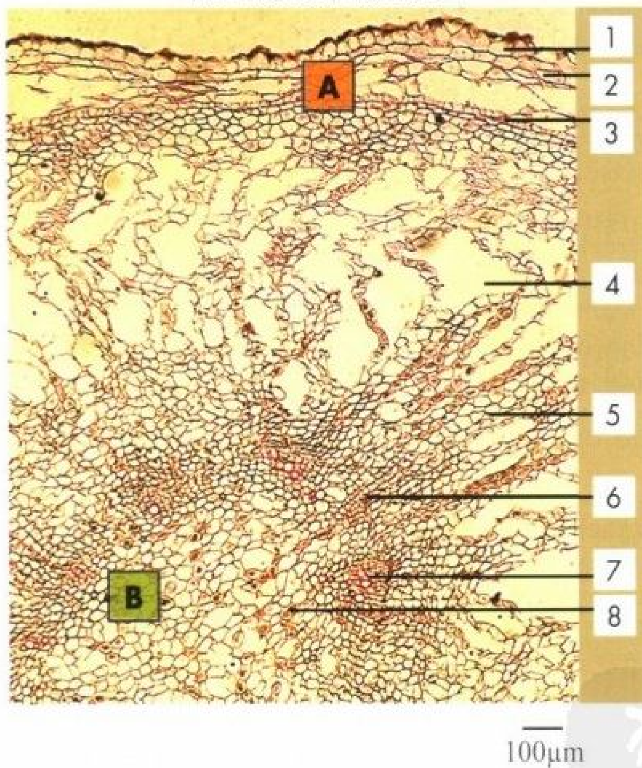
龙胆 Longdan

The dried root and rhizome of *Gentiana scabra* Bge. (Fam. Gentianaceae).
龙胆科植物龙胆的干燥根及根茎。

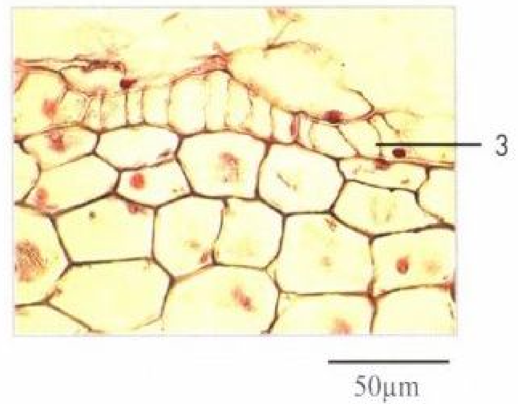
Sketch of transverse section of rhizome
根茎横切面简图



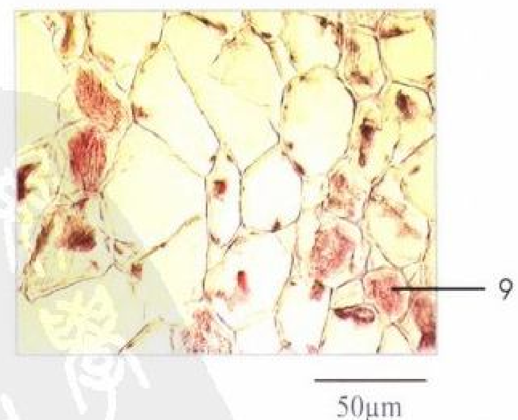
Transverse section of rhizome
根茎横切面组织图



A Endodermis cells
内皮层细胞



B Parenchymatous cells containing raphides of calcium oxalate
薄壁细胞含有草酸钙针晶



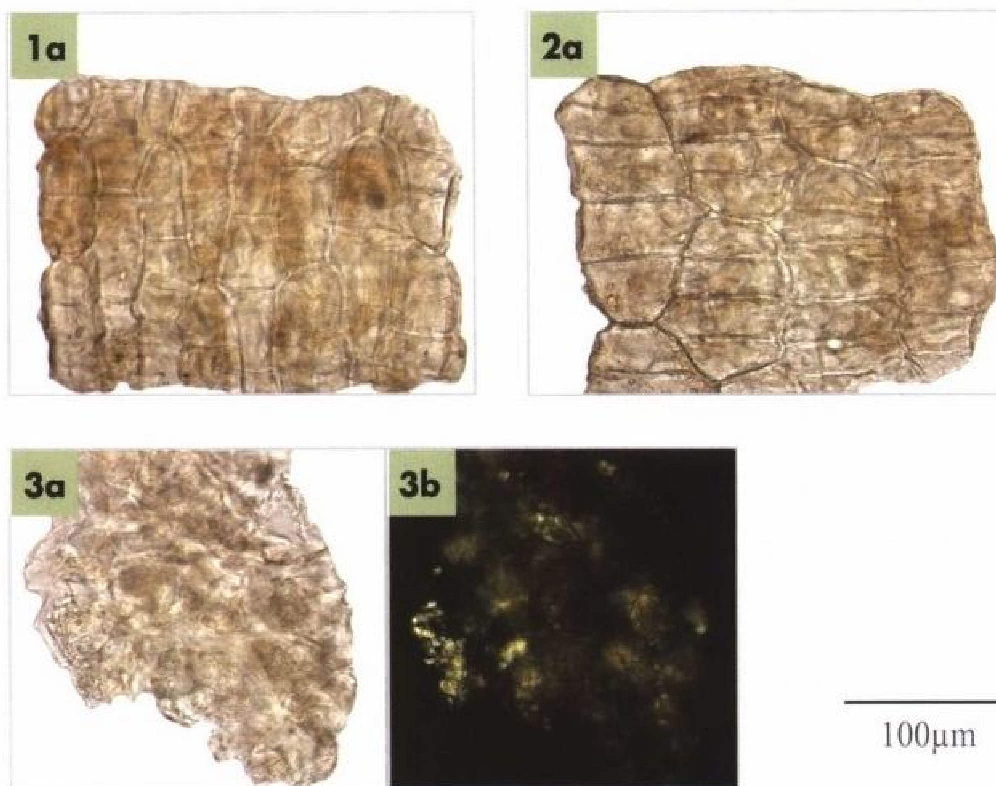
Transverse section of rhizoma

1. Exodermis	Cells subsquare, the walls slightly thick, suberized.
2. Cortex	Narrow.
3. Endodermis	Cells elongated tangentially, each cell divided by longitudinal walls into several subsquare small cells.
4. Clefts	Distributed in cortex and phloem.
5. Phloem	Broad, with clefts.
6. Cambium	Indistinct.
7. Xylem	3~10 vessels in groups.
8. Pith	Distinct.
9. Raphides of calcium oxalate	Scattered in parenchymatous cells.

根茎横切面组织图注

1. 外皮层	细胞类方形，壁稍厚，木栓化。
2. 皮层	窄。
3. 内皮层	细胞切向延长，每一细胞由纵向壁分隔成数个类方形小细胞。
4. 裂隙	分布于皮层和韧皮部。
5. 韧皮部	宽广，有裂隙。
6. 形成层	不甚明显。
7. 木质部	导管3~10个群束。
8. 髓部	明显。
9. 草酸钙针晶	散在于薄壁细胞中。





Notes

1. Exodermis fragments	Abundant, long and big cells, complete cells subfusiform on the surface view, each cell separated by transverse walls into several small cells.
2. Endodermis fragments	Big cells, complete cells subrectangular on the surface view, each cell divided by longitudinal walls into several small cells.
3. Raphides of calcium oxalate	Abundant, fine irregularly scattered in parenchymatous cells or in the corner of the cells. Polychrome observed under a polarizing microscope.

图注

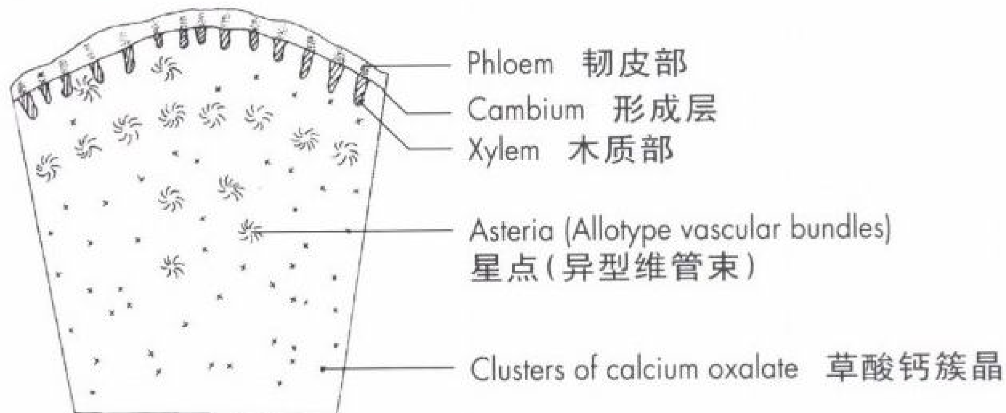
1. 外皮层碎片	多见，细胞长大，完整者表面观呈类纺锤形，每一细胞由横向壁分割成数个小细胞。
2. 内皮层碎片	细胞大，完整者表面观类长方形，每一细胞由纵向壁分割成数个小细胞。
3. 草酸钙针晶	较多，细小不规则散在于薄壁细胞或位于细胞的一角。偏光显微镜下呈多彩状。

大黄 Dahuang

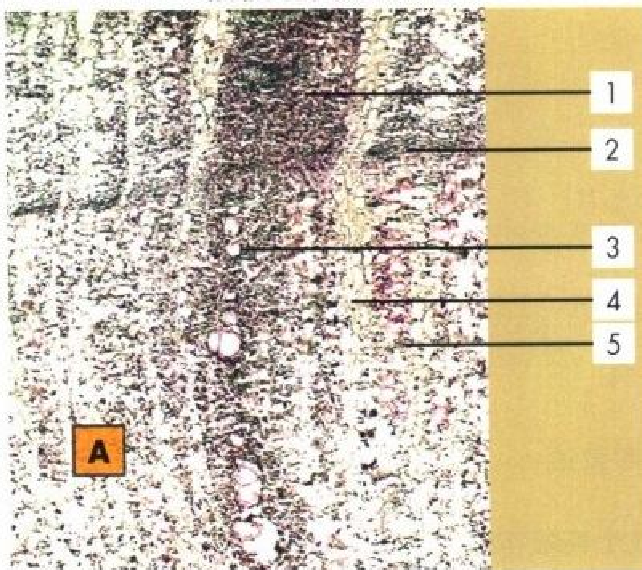


The dried root and rhizome of *Rheum palmatum* L. (Polygonaceae).
蓼科植物掌叶大黄的干燥根及根茎。

Sketch of transverse section of rhizome
根茎横切面简图

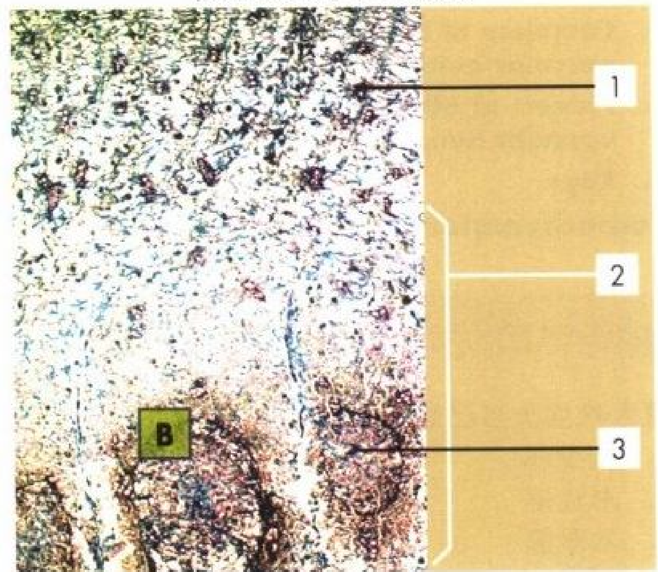


Transverse section of root
根横切面组织图



100μm

Transverse section of rhizome
根茎横切面组织图



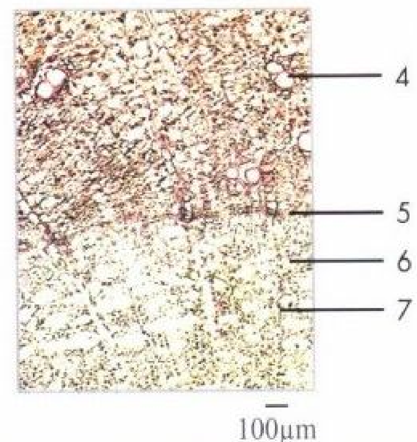
50μm

A Parenchymatous cells containing clusters of calcium oxalate
薄壁细胞含有草酸钙簇晶



50μm

B Allotype vascular bundle
异型维管束



100μm

Transverse section of root

Most cork layers of root are removed.

1. Phloem	Sieve tube groups distinct; parenchyma developed well.
2. Cambium	Cambium ring distinct.
3. Xylem	Vessels non-lignified; usually single or several grouped; sparsely arranged.
4. Rays	Densely; 2~4 rows cell wide.
5. Parenchymatous cells	Containing large clusters of calcium oxalate; 20~160μm in diameter.

Transverse section of root

Cork, cortex and phloem of rhizome mostly removed.

1. Xylem	Rays densely; frequently one to several vessles sparsely arranged.
2. Pith	Board; scattered with allotype vascular bundles.
3. Allotype vascular bundle	(key feature of rhizome)
4. Xylem of allotype vascular bundle	Outside of cambium.
5. Cambium of allotype vascular bundle	Forming a ring.
6. Phloem of allotype vascular bundle	Inside of cambium.
7. Rays	Stellately radiated.
Parenchymatous cells	Containing clusters of calcium oxalate.

根横切面组织图注

根木栓层大多已除去。

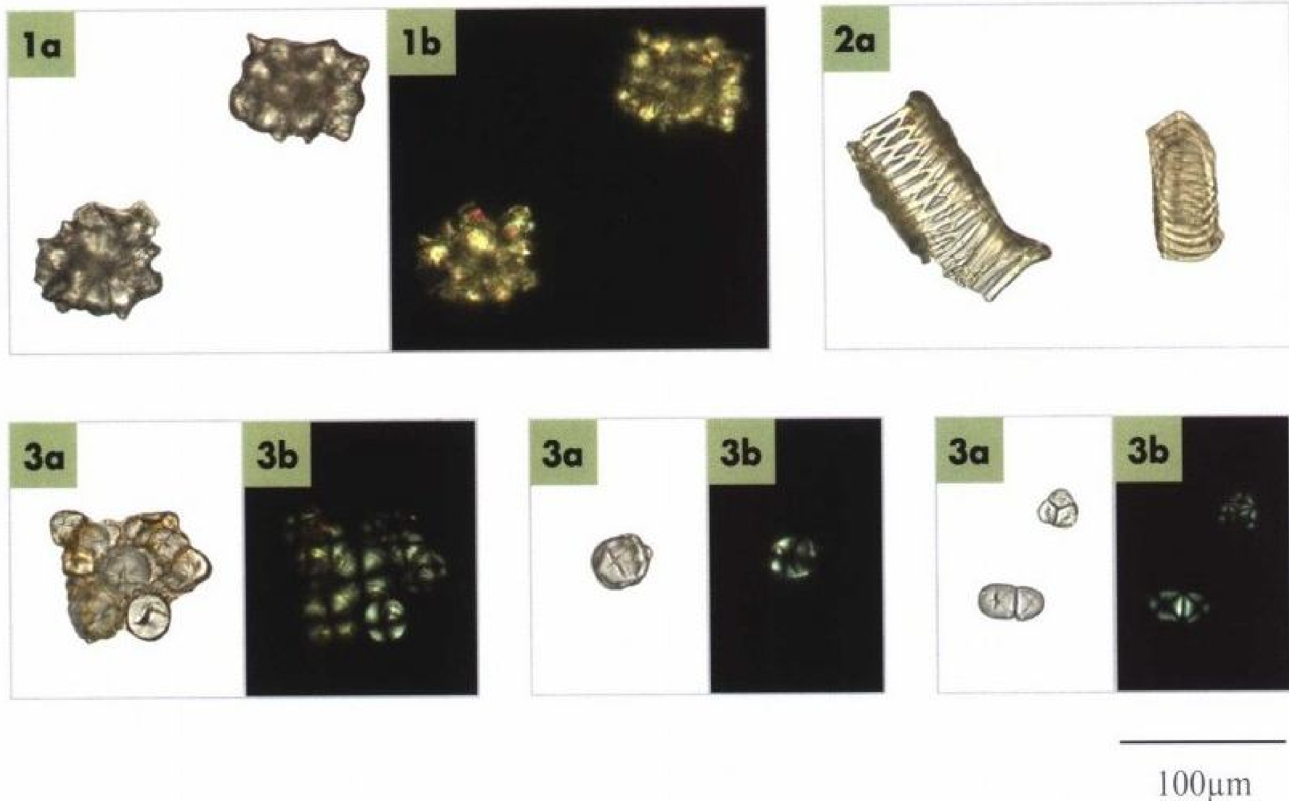
1. 韧皮部	筛管群明显，薄壁组织发达。
2. 形成层	环状明显。
3. 木质部	导管非木化，常1~数个稀疏排列。
4. 射线	较密，宽2~4列细胞。
5. 薄壁细胞	含大型草酸钙簇晶，直径20~160μm。

根茎横切面组织图注

根茎木栓层、皮层、韧皮部大多已除去。

1. 木质部	射线较密，导管常1到数个稀疏排列。
2. 髓部	宽广，有异型维管束散在。
3. 异型维管束	（为根茎的主要特征）
4. 异型维管束的木质部	在形成层外方。
5. 异型维管束的形成层	成环。
6. 异型维管束的韧皮部	在形成层内方。
7. 射线	呈星状射出。
薄壁细胞	含草酸钙簇晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Clusters of calcium oxalate	Abundant; subrounded or semicircular shaped; 21~135μm in diameter; mainly with short and obtuse angles. Brightly yellowish-white color separated by polychrome observed under a polarizing microscope.
2. Vessels	Mainly reticulate or bordered pitted vessels; spiral vessels occasionally observed. Brightly pale green in color observed under a polarizing microscope.
3. Starch granules	Simple granules subrounded or polygonal, hilum stellate; compound granules composed of 2~7 components. Black cruciate shape was observed under a polarizing microscope.

图注

1. 草酸钙簇晶	较多，类圆形或半圆形，直径21~135μm，棱角大多短钝。偏光显微镜下结晶呈亮黄白色间多彩状。
2. 导管	多为网纹或具缘纹孔导管，偶见螺纹导管。
3. 淀粉粒	单粒类圆形或多角形，脐点星状，复粒由2~7分粒组成。偏光显微镜下呈黑十字现象。

刺五加 Ciwujia

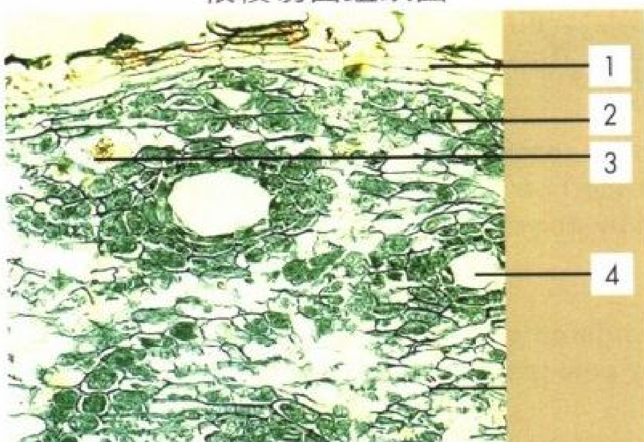


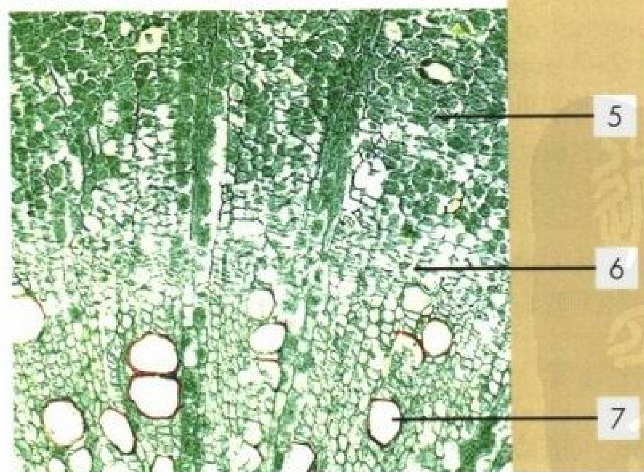
The dried root and rhizome of *Acanthopanax senticosus* (Rupr.et Maxim.) Harms (Fam. Araliaceae).
五加科植物刺五加的干燥根及根茎。

Sketch of transverse section of root 根横切面简图



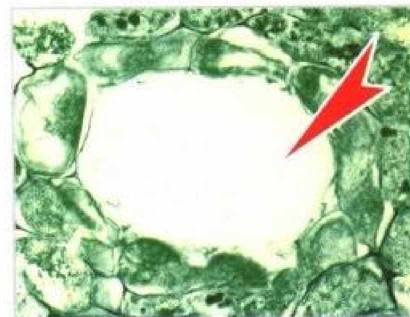
Transverse section of root 根横切面组织图





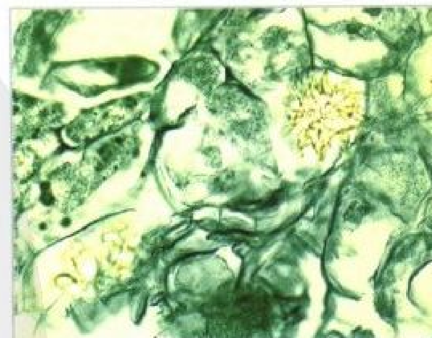
100μm

Secretory canal 分泌道



50μm

Clusters of calcium oxalate 草酸钙簇晶



50μm

Transverse section of root

1. Cork	Dozens of cell rows.
2. Cortex	Very thin, scattered with secretory canals; most of parenchymatous cells containing clusters of calcium oxalate, 11~64μm in diameter.
3. Clusters of calcium oxalate	Scattered in parenchymatous cells.
4. Secretory canals	Scattered in cortex and phloem; subrounded or elliptical.
5. Pholem	Outer side of phloem scattered with numerous fibre bundles, which gradually decreasing inwards.
6. Cambium	In a ring.
7. Xylem	Occupied a majority of root, rays 1~3 rows of cells wide; vessels relatively thin-walled, mostly several grouped; xylem fibres developed.

根横切面组织图注

1. 木栓层	数十列细胞。
2. 皮层	菲薄，散有分泌道；薄壁细胞大多含草酸钙簇晶，直径11~64μm。
3. 草酸钙簇晶	散在于薄壁细胞中。
4. 分泌道	散在于皮层及韧皮部，类圆形或椭圆形。
5. 韧皮部	外侧散有较多纤维束，向内渐少。
6. 形成层	成环。
7. 木质部	占大部分，射线宽1~3列细胞；导管壁较薄，多数个相聚；木纤维发达。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Phloem fibres	Numerous, often present in bundles, sometimes occurring singly; pale yellow in color, long strip-shaped, straight or slightly curved; some fibres with one side wavy, endings somewhat sharp or blunt; pit canals thick and dense, oblique and crisscross striations on the surface; some cellular lumina with very thin septa.
2. Clusters of calcium oxalate	Numerous, 9~85μm in diameter; corner angles big and obtuse; often fragmented; some crystal cells subsquare, several cells connected together; clusters arranged in rows. Polychrome in color observed under a polarizing microscope.
3. Phloem ray cells	Colorless or pale yellow; subrounded or long-round in shape in the longitudinal section, the tangential walls with oblique crisscross or irregularly reticulated striations.
4. Cork cells	Pale yellow or yellowish-brown in color; subpolygonal or subrectangular in shape on the surface view, while oblate in the transverse section; the walls thin.

图注

1. 韧皮纤维	较多，常成束，也有单个散离。淡黄色，长条形，平直或稍弯曲，有的一边波状，末端稍尖或钝圆，孔沟粗而密，表面可见斜向交错纹理，有的胞腔具菲薄横隔。
2. 草酸钙簇晶	多。直径9~85μm，棱角大而较钝，常破碎，有的含晶细胞类方形，数个相接，簇晶排列成行。偏光显微镜下呈多彩色。
3. 韧皮射线细胞	无色或淡黄色。切向纵断面观呈类圆形或长圆形，切向壁具斜向交错或不规则网状纹理。
4. 木栓细胞	淡黄色或黄棕色。表面观类多角形或类长方形，横断面观扁长，壁薄。

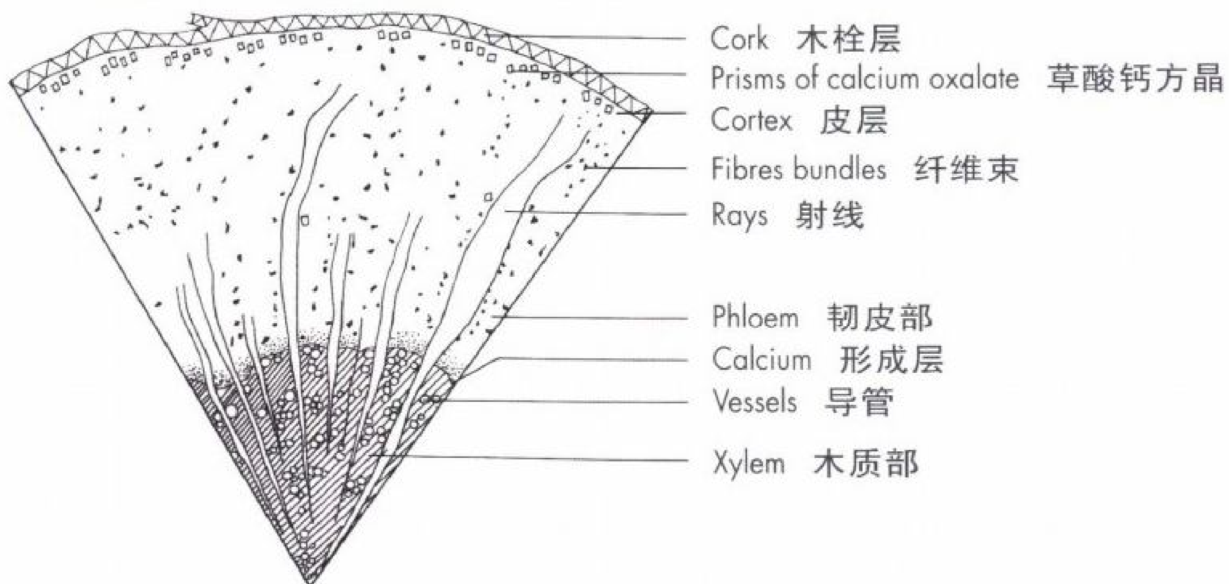
Radix et Rhizoma Sophorae Tonkinensis

山豆根 Shandougen

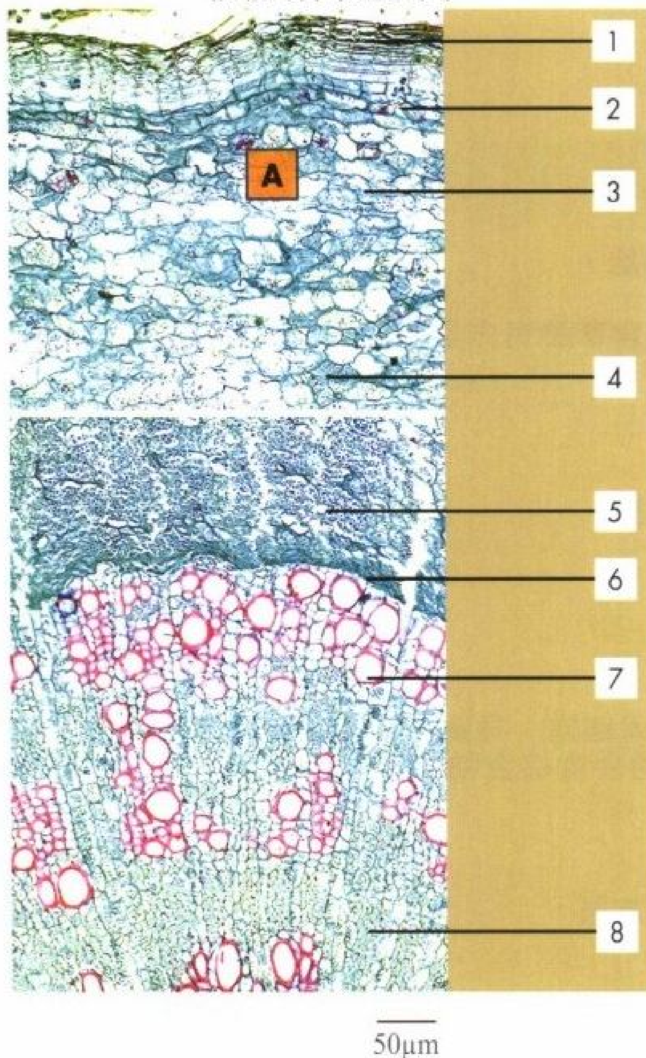


The dried root and rhizome of *Sophora tonkinensis* Gapnep. (Fam. Leguminosae).
豆科植物越南槐的干燥根及根茎。

Sketch of transverse section of root
根横切面简图

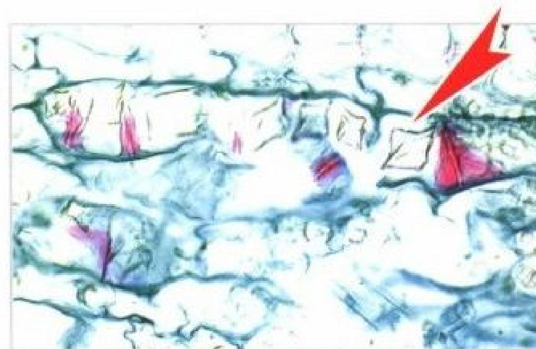


Transverse section of root
根横切面组织图



50μm

A *Crystal cells*
含晶细胞



50μm



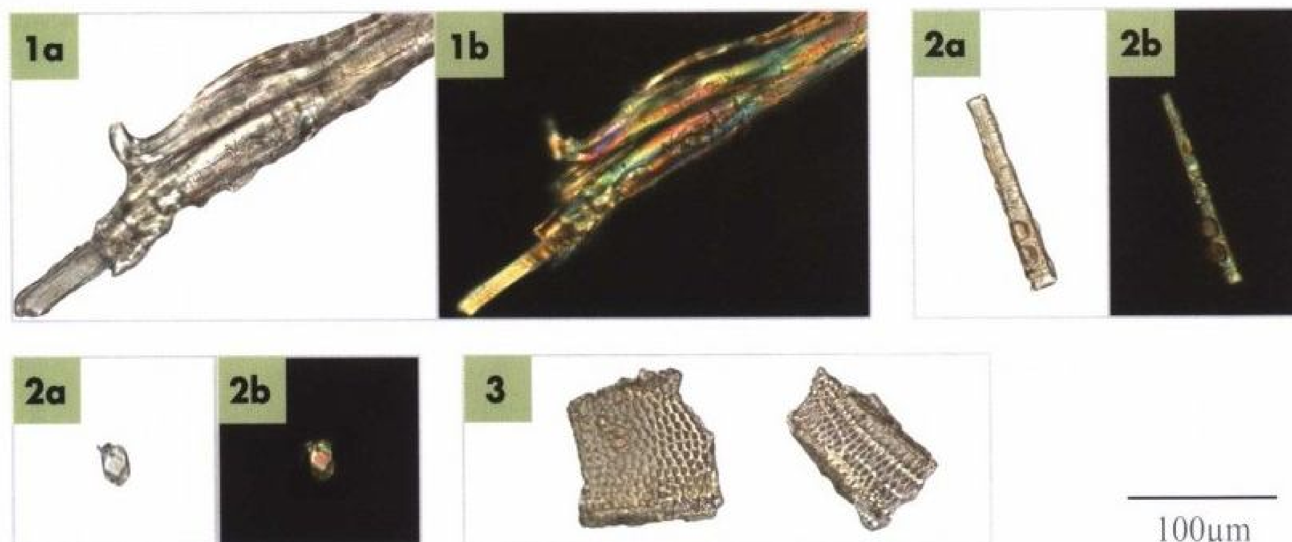
Transverse section of root

1. Cork	Consisting of several to over 10 rows of cells.
2. Crystal cells	Existed in the outside of cortex; with 1 or 2~3 crystal cells in the walls of the crystal cells lignified and thickened; arranged interrupted.
3. Cortex	Relatively broad.
4. Fibre bundles	Scattered in the cortex and phloem.
5. Phloem	Within fibre bundles.
6. Cambium	In a ring.
7. Xylem	Developed, rays 1~8 rows of cell wide; vessels subrounded, mostly singly scattered, or 2 to several vessels aggregated in groups, some containing yellowish-brown contents (before the treatment of dying). In groups and scattered.
8. Xylem fibres	Scattered; in groups.
Parenchymatous cells	Filled with starch granules, few cells containing prisms of calcium oxalate.

根横切面组织图注

1. 木栓层	为数列至10数列细胞。
2. 含晶细胞	位于皮层外侧，内含草酸钙方晶1或2~3个，细胞壁木化，断续成环。
3. 皮层	较宽。
4. 纤维束	散在于皮层及韧皮部。
5. 韧皮部	有纤维束。
6. 形成层	成环。
7. 木质部	发达，射线宽1~8列细胞；导管类圆形，大多单个散在，或2至数个相聚，有的含黄棕色物(染色处理前)。
8. 木纤维	散在，成束。
薄壁细胞	含淀粉粒，少数含方晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibers and crystal fibers	Present in loose bundles or distributed singly; colorless or yellow-brown. Fibers slender and often twisted, with endings obtuse round; the walls non-lignified and extremely thick; the primary walls clear, easily separated from the secondary walls; irregular striations seen on the surface view, while the broken endings demonstrating broom-like striae; the cellular lumina fine and small; the fiber surrounding cells containing clusters of calcium oxalate, some of which forming crystal fibers. Polychrome in color of the fibre and crystals under a polarizing microscope.
2. Prisms of calcium oxalates	Abundant, scattered or present in sclerenchymatous cells; double conical, subsquare, rhombic, polygonal or irregular lumps in shape. Visible under a polarizing microscope.
3. Vessels	Pale yellow or golden yellow; mainly reticulate and bordered pitted vessels; some containing pale yellow or golden yellow contents; the reticulate vessel members fine and long with the sharp or obtuse round endings; while the bordered pitted vessel members big and short with the truncate endings; some border pits parallel thus the linear pit apertures formed.

图注

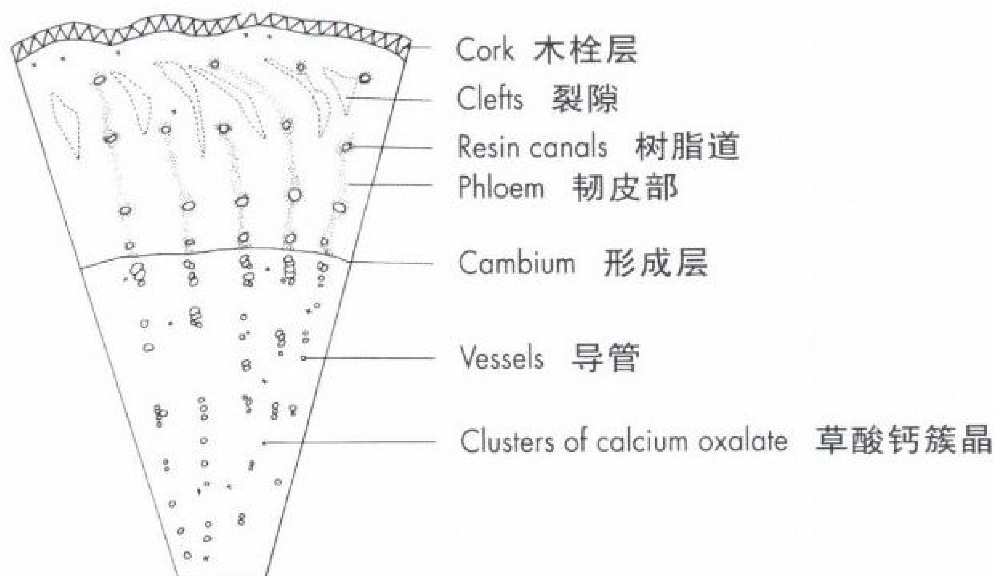
1. 纤维及晶纤维	成松散的束或单个散在，无色或黄棕色。纤维细长，常扭曲，末端钝圆，壁极厚，非木化；初生壁明显，易与次生壁分离，表面有不规则纵裂纹，断端纵裂略成帚状，胞腔微细。纤维束周围细胞有含草酸钙方晶，形成晶纤维。偏光显微镜下纤维与晶体成多彩色。
2. 草酸钙方晶	众多，散在或存在于厚壁细胞中。呈双锥形、类方形、菱形、多面形或不规则块状。偏光下可见。
3. 导管	淡黄色或金黄色。主为网纹及具缘纹孔导管，有的含淡黄色或金黄色物。网纹导管分子细长，末端尾尖或钝圆；具缘纹孔导管分子粗大，末端常平截，有的具缘纹孔数个并列，纹孔口连接成线。



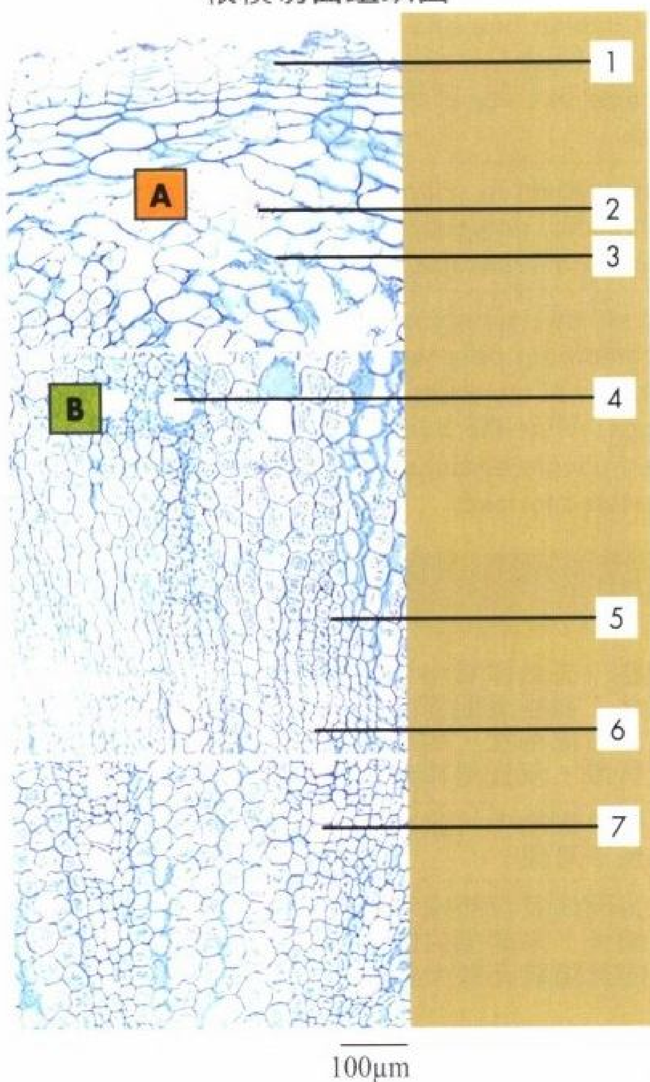
人参 Renshen

The dried root and rhizome of *Panax ginseng* C. A. Mey. (Fam. Araliaceae).
五加科植物人参干燥的根和根茎。

Sketch of transverse section of root
根横切面简图



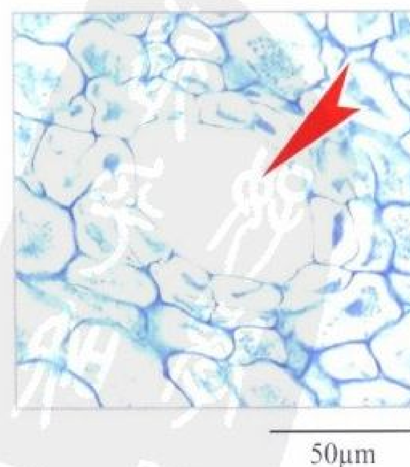
Transverse section of root
根横切面组织图



A **Cluster of calcium oxalate**
草酸钙簇晶



B **Resin canal**
树脂道



Transverse section of root

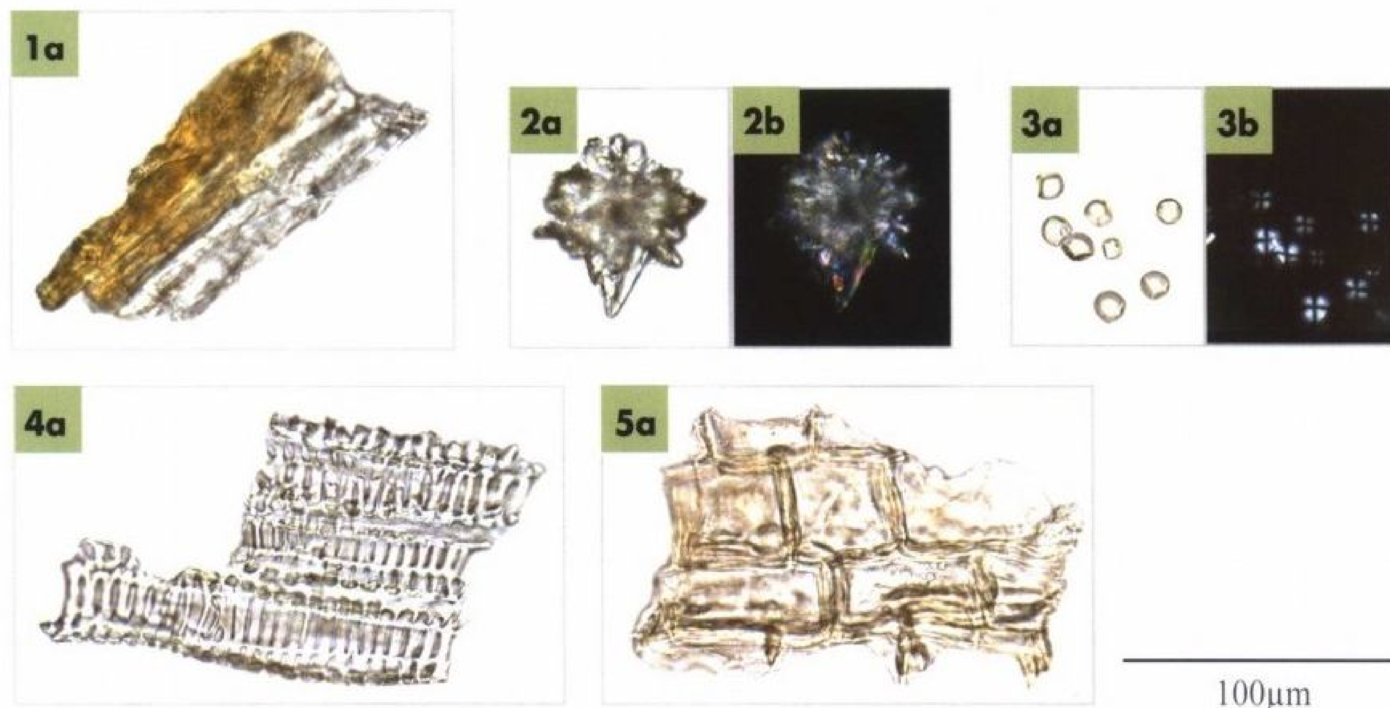
1. Cork	Several rows of flat cells.
2. Clusters of calcium oxalate	Scattered in the parenchymatous cells.
3. Cortex	Narrow.
4. Resin canals	Subrounded, containing yellow secretions (before dying treatment).
5. Phloem	Showing clefts outside and internal cells arranged densely; resin canals scattered.
6. Cambium	In a ring.
7. Xylem	Rays broad. Vessels occured singly or in groups; interruptedly radially arranged.

根横切面组织图注

1. 木栓层	为数列扁平细胞。
2. 草酸钙簇晶	分散于薄壁细胞中。
3. 皮层	窄。
4. 树脂道	类圆形，内含黄色分泌物(染色处理前)。
5. 韧皮部	外侧有裂隙，内侧细胞较紧密，散在有树脂道。
6. 形成层	成环。
7. 木质部	射线宽广，导管单个散在或数个相聚，断续排列成放射状。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Resin canals	Fragments visible; lumina containing pale yellow or yellowish-brown secretions.
2. Clusters of calcium oxalate	Relatively long in diameter; with sharp or obtuse angles. Polychrome under a polarizing microscope.
3. Starch granules	Numerous, simple granules subspherical; semicircular or irregularly polygonal; 4~20μm in diameter; hilum dotted or slit-shaped; compound granules of 2~6 components. Black, cruciate shape observed under a polarizing microscope.
4. Vessels	Mainly reticulate or scalariform vessels; 10~56μm in diameter; pits of reticulate vessels relatively big.
5. Cork cells	Subsquare, subrectangular or polygonal on the surface view; walls thin and curred in the form of fine undulance; cells flat in the transverse section.

图注

1. 树脂道	碎片易见，腔道中含淡黄色或黄棕色分泌物。
2. 草酸钙簇晶	直径较大，棱角锐尖或钝尖。偏光显微镜下多彩状。
3. 淀粉粒	甚多，单粒类球形、半圆形或不规则多角形，直径4~20μm，脐点点状或裂缝状，复粒由2分粒~6分粒组成。偏光显微镜下呈黑十字状。
4. 导管	主为网纹或梯纹导管，直径10~56μm，网纹导管的纹孔较大。
5. 木栓细胞	表面观类方形、类长方形或多角形，壁薄，细波状弯曲，断面观细胞扁平。

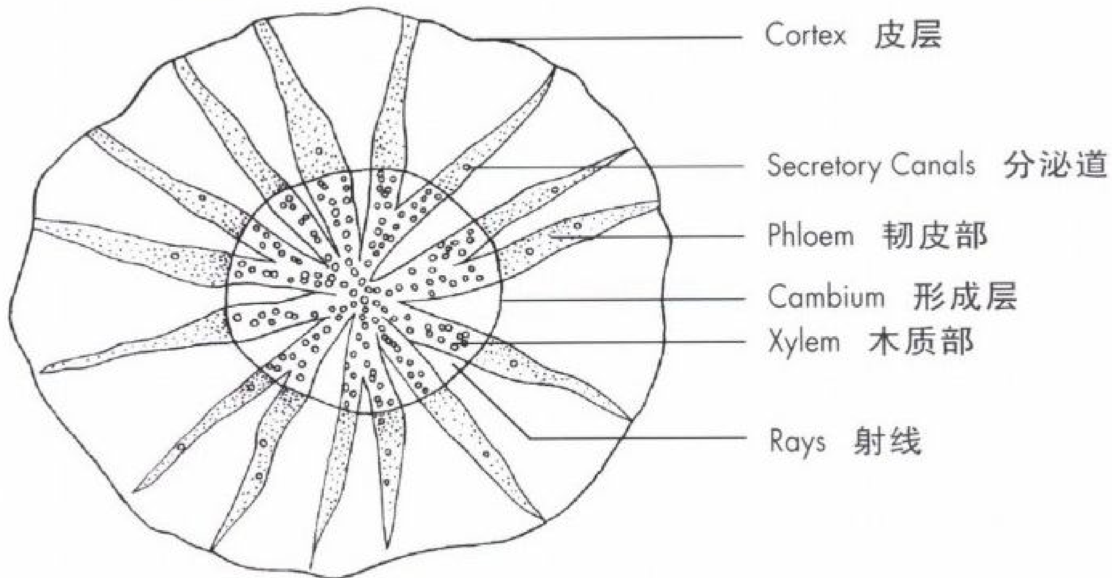


北沙参 Beishashen

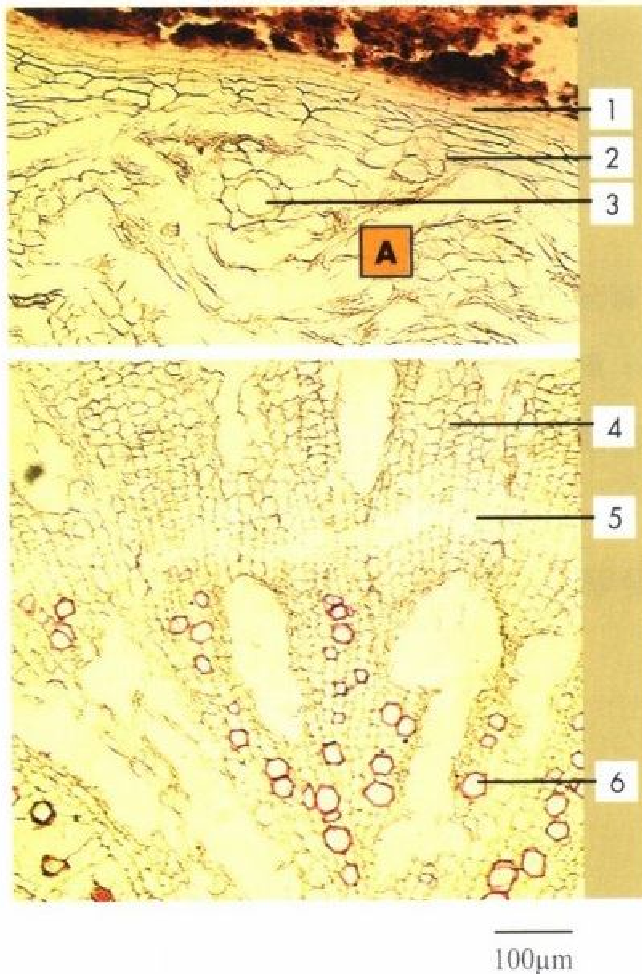
The dried root of *Glehnia littoralis* Fr. Schmidt ex Miq. (Fam. Umbelliferae).

伞形科植物珊瑚菜的干燥根。

Sketch of transverse section of root
根横切面组织简图

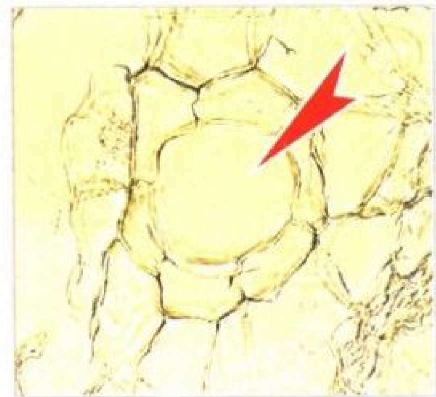


Transverse section of root
根横切面组织图



100μm

A **Secretory canal**
分泌道



50μm

Transverse section of root

1. Cork	(Corks of commercial medicinal materials are removed)
2. Cortex	Consisting of several rows of parenchymatous cells; scattered with secretory canals.
3. Secretory canals	Containing yellow-brown secretion; surrounded by 5~8 secretory cells.
4. Phloem	Broad, sieve tube groups obliterated in the outer part and strip-shaped.
5. Cambium	In a ring.
6. Xylem	Rays 2~5 rows of cells; most vessels arranged in V-shape.

根横切面组织图注

1. 木栓层	（商品药材已除去）
2. 皮层	为数列薄壁细胞，有分泌道散在。
3. 分泌道	内含黄棕色分泌物，周围分泌细胞5~8个。
4. 韧皮部	宽广，外侧筛管群颓废作条状。
5. 形成层	成环。
6. 木质部	射线2~5列细胞，导管大多呈“V”形排列。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Vessels	Numerous, mainly reticulate vessels with long and wide pits; while few spiral vessels.
2. Secretary canals	Frequently seen; secretary cells and canals containing yellow secretion; while golden segemented sections occured in some canals with 9~69μm in diameter.
3. Starch granules	Starch granules being gelatinized after processed; irregular mass in shape; non-processed materials include a huge number of starch granules mainly being single in occurrence while few present combined; simple granules round or subrounded; hilum clear.

图注

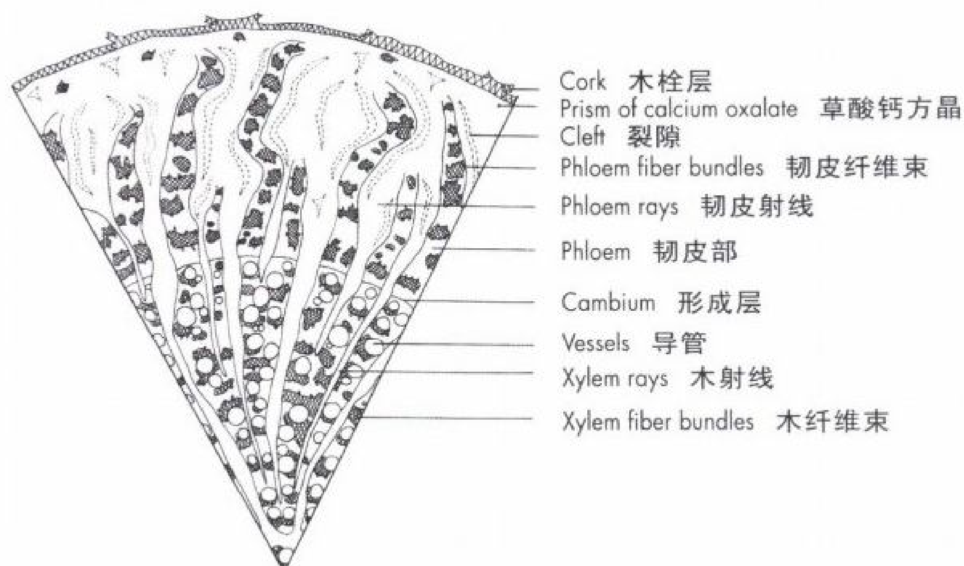
1. 导管	较多，多为网纹导管，网孔长而宽；稀螺纹导管。
2. 分泌道	多见，分泌细胞及分泌道中含黄色分泌物，有些分泌道中可见条节状金黄色分泌物，直径9~69μm。
3. 淀粉粒	加工后药材的淀粉粒多糊化，呈不规则团块状；未加工的药材淀粉粒极多，多单粒，稀复粒或半复粒；单粒圆形、类圆形，脐点明显。

Radix Glycyrrhizae

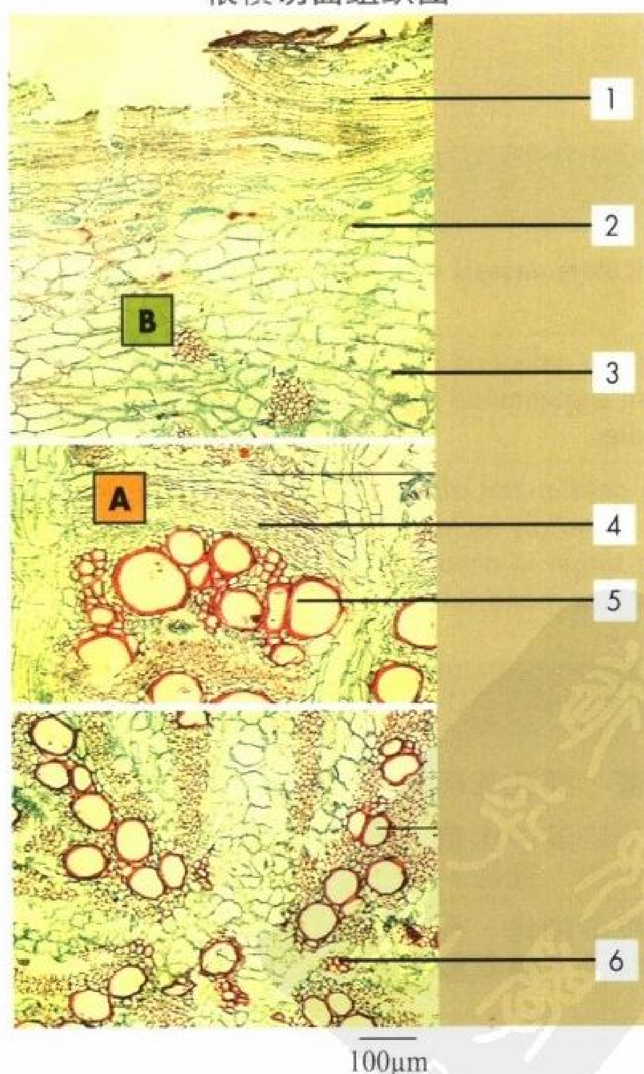
甘草 Gancao

The dried root and rhizome of *Glycyrrhiza uralensis* Fisch. (Fam. Leguminosae).
豆科植物甘草干燥根及根茎。

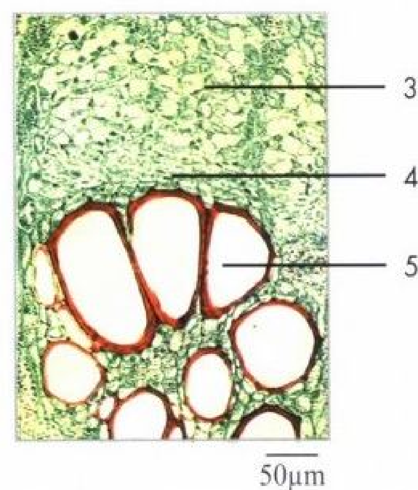
Sketch of transverse section of root
根横切面简图



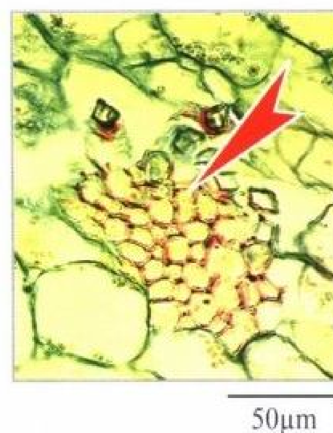
Transverse section of root
根横切面组织图



A Vascular bundles
维管束



B Fibre bundles
纤维束



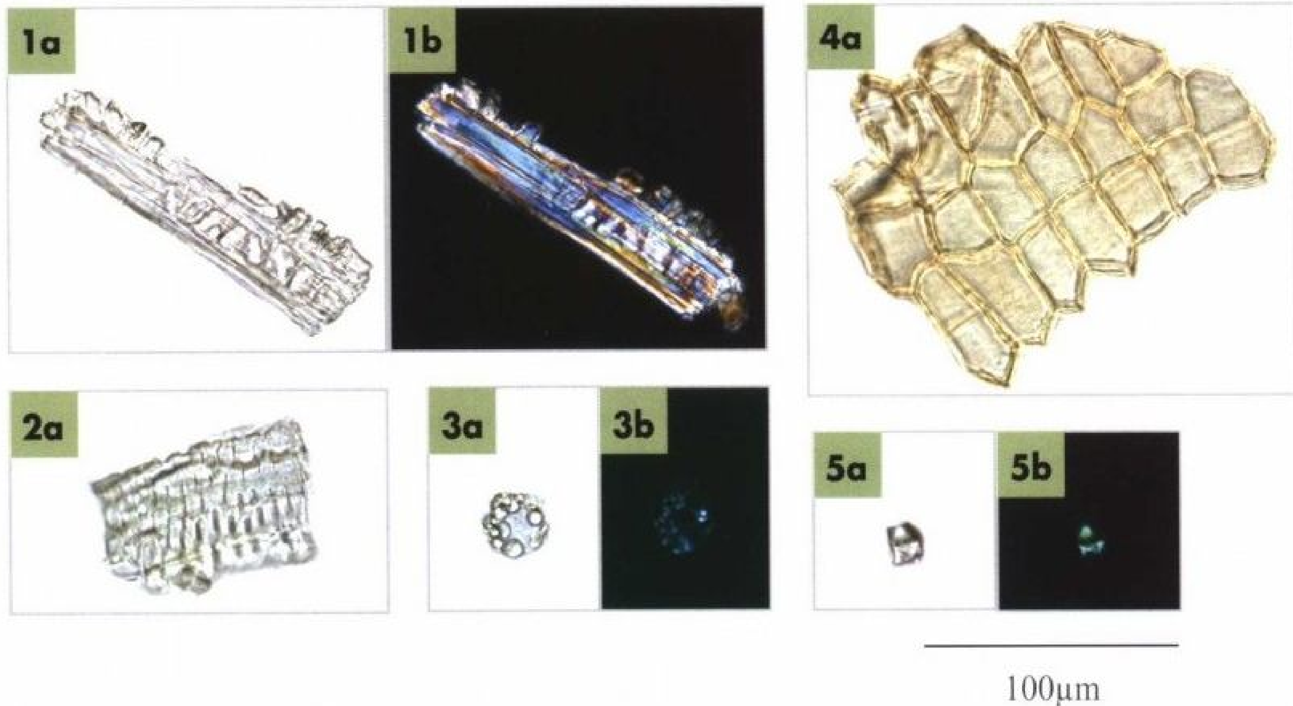
Transverse section of root

1. Cork	Consisting of several layers of brown cells.
2. Cortex	Relatively narrow.
3. Phloem	Rays broad; mostly curved; frequently with clefts; most phloem bundles in fibres; slightly lignified or lignified; surrounded by parenchymatous cells containing prisms of calcium oxalate; sieve tube groups usually collapsed as pressed.
4. Cambium	Fascicular cambium distinct; while interfascicular cambium indistinct.
5. Xylem	Rays 3~5 rows of cells wide; vessels numerous; about to 160μm in diameter.
6. Xylem fibres	Xylem fibres in bundles; surrounded by parenchymatous cells containing prisms of calcium oxalate; formed crystal sheath-fibres.

根横切面组织图注

1. 木栓层	为数列棕色细胞。
2. 皮层	较窄。
3. 韧皮部	射线宽广，多弯曲，常现裂隙；纤维多成束，微木化或木化，周围薄壁细胞含草酸钙方晶；筛管群常因压缩变形。
4. 形成层	束内形成层明显，束间形成层不明显。
5. 木质部	射线宽3～5列细胞；导管较多，直径约至160μm。
6. 木纤维	成束，周围薄壁细胞含草酸钙方晶，形成晶鞘纤维。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibers	Mostly in bundles; surrounding parenchymatous cells containing prisms of calcium oxalate; formed crystal sheath-fibres. Polychrome observed under a polarizing microscope.
2. Vessels	Mainly bordered pitted vessels; relatively big; usually broken; reticulate vessels scarce. Yellowish-green in color observed under a polarizing microscope.
3. Starch granules	Abundant. Simple granules elliptical; oval or subglobular; 3~10μm in diameter; compound granules of 2 components; scarce. Black cruciate shape under a polarizing microscope.
4. Cork cells	Reddish-brown; polygonal on the surface view; slightly lignified.
5. Prism of calcium oxalate	In the form of slightly flat double cones; rectangle or subsquare; about to 16μm in diameter; to 24μm in length. Visible under a polarizing microscope.

图注

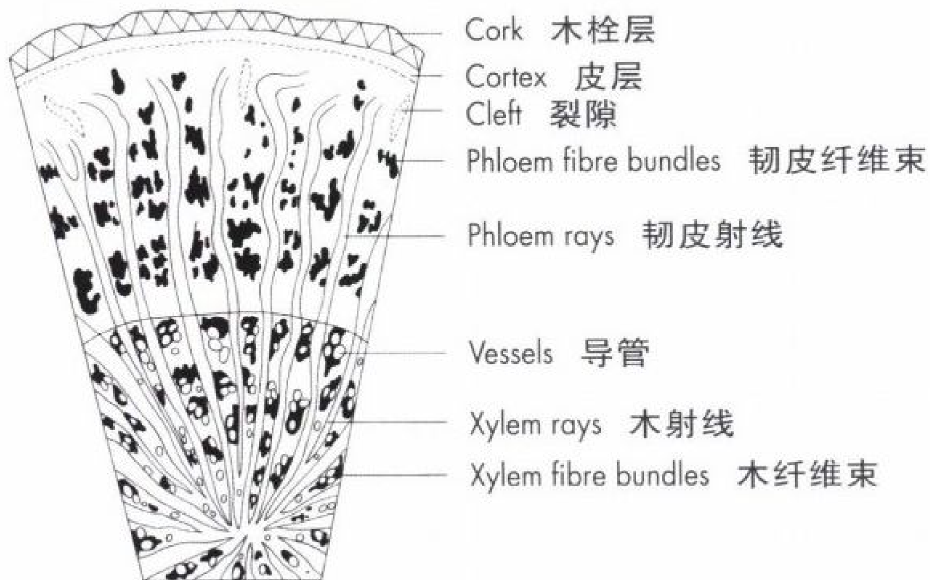
1. 纤维	多成束，周围细胞中含有草酸钙方晶，形成晶纤维。偏光显微镜下一般呈多彩状。
2. 导管	主为具缘纹孔导管，较大，多破碎，稀有网纹导管。偏光显微镜下导管一般呈黄绿色。
3. 淀粉粒	较多，单粒椭圆形、卵形或类球形，直径3~10μm；复粒稀少，由2分粒组成。偏光显微镜下呈黑十字状。
4. 木栓细胞	红棕色，表面观呈多角形，微木化。
5. 草酸钙方晶	呈略扁的类双锥形、长方形或类方形，直径约至16μm，长至24μm。偏光下可见。

红芪 Hongqi

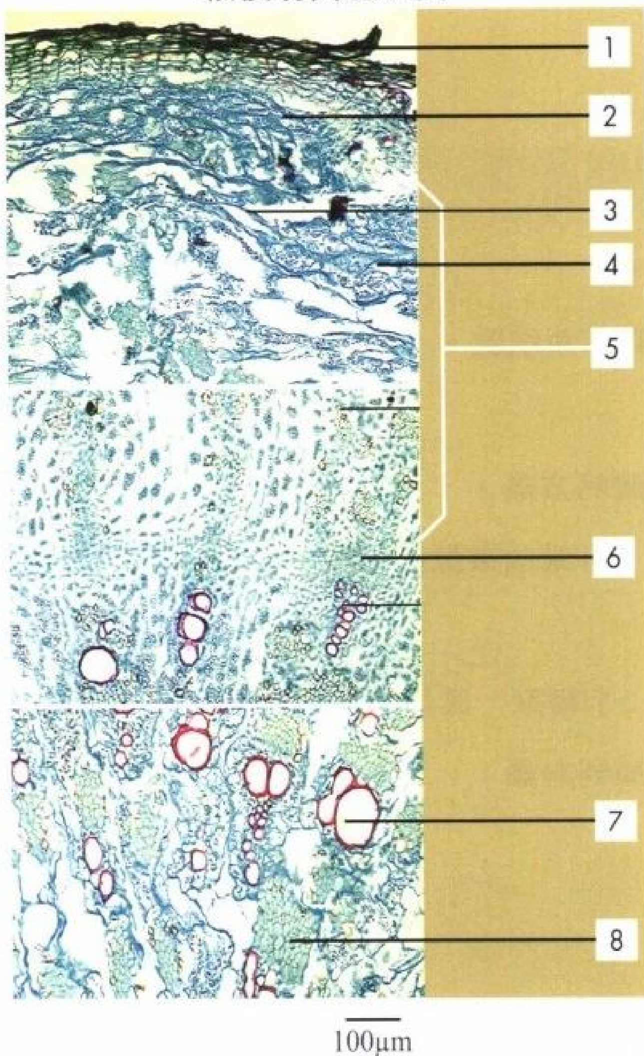


The dried root of *Hedysarum polybotrys* Hand. - Mazz. (Fam. Leguminosae).
豆科植物多序岩黄芪的干燥根。

Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



Fibre bundles
纤维束



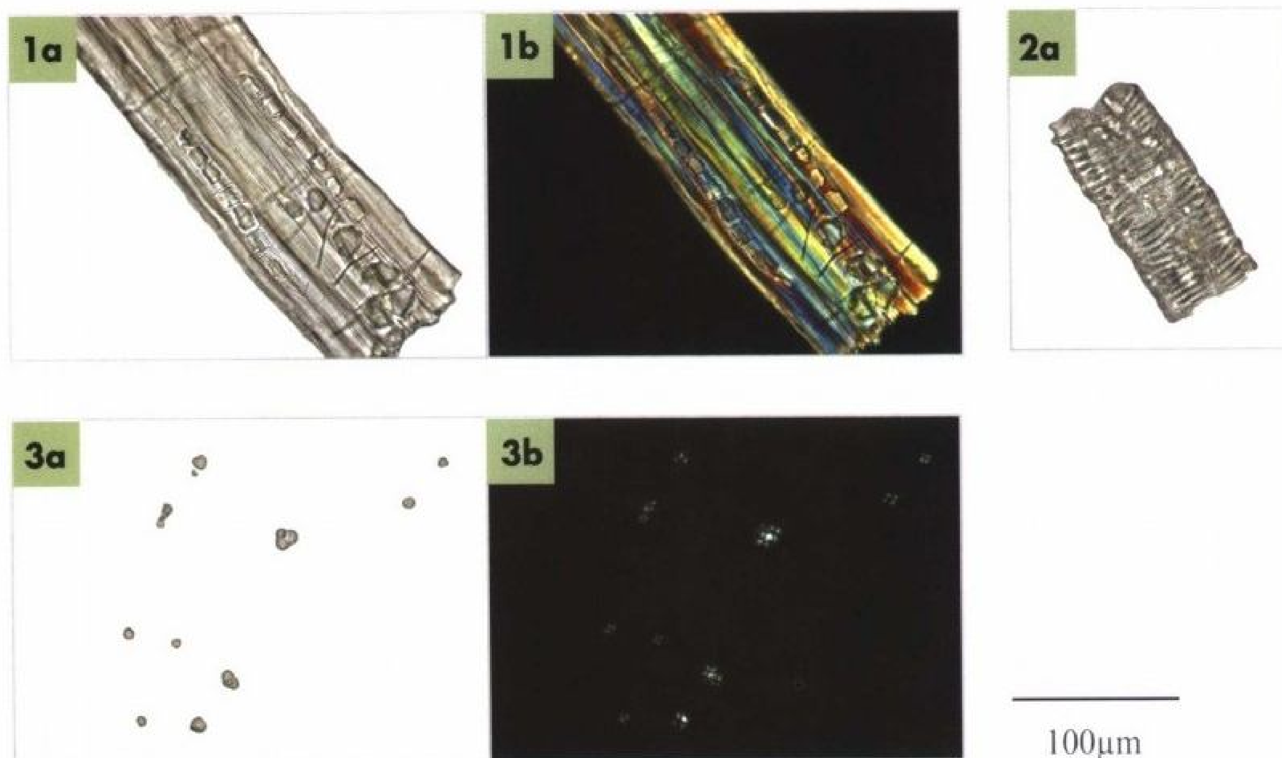
Transverse section of root

1. Cork	Consisting of 6~8 rows of cork cells.
2. Cortex	Narrow, with 2~4 rows of collenchymatous cells at the outside.
3. Clefts	Common.
4. Phloem fibre bundles	Surrounding parenchymatous cells containing prisms of calcium oxalate.
5. Phloem	Relatively broad, with clefts at the outside, scattered with fibres in bundles, the outside of phloem rays usually curved.
6. Cambium	Forming a ring.
7. Xylem	Vessels singly scattered or 2~3 grouped, surrounded by xylem fibres.
8. Xylem fibre bundles	Surrounding parenchymatous cells containing prisms of calcium oxalate.

根横切面组织图注

1. 木栓层	为6~8列木栓细胞。
2. 皮层	狭窄，外侧有2~4列厚角细胞。
3. 裂隙	常见。
4. 韧皮纤维束	周围薄壁细胞含草酸钙方晶。
5. 韧皮部	较宽，外侧有裂隙，纤维成束散在，韧皮射线外侧常弯曲。
6. 形成层	成环。
7. 木质部	导管单个散在或2~3个相聚，其周围有木纤维。
8. 木纤维束	周围薄壁细胞含草酸钙方晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Crystal fibres	Fibers in bundles, with thickened and slightly lignified walls. Surrounding cells containing prisms of calcium oxalate, 7~14μm in diameter. Crystal cells with unevenly thickened walls. Brightly polychrome observed under a polarizing microscope.
2. Vessels	Reticulate or bordered pitted vessels, up to 145μm in diameter.
3. Starch granules	Simple granules subrounded or elliptical, 2~19μm in diameter, compound granules composed of 2~8 components; showing black cruciate shape under a polarizing microscope.

图注

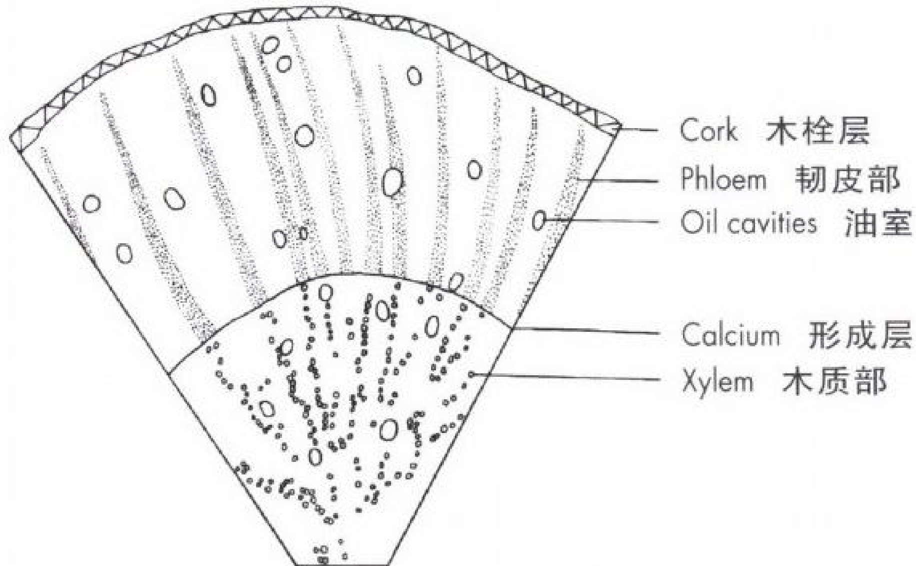
1. 晶纤维	纤维成束，壁厚，微木化，周围细胞含草酸钙方晶，方晶直径7~14μm，含晶细胞壁不均匀增厚。偏光显微镜下晶纤维呈明亮多彩状。
2. 导管	网纹或具缘纹孔导管，直径至145μm。
3. 淀粉粒	单粒类圆形或椭圆形，直径2~19μm；复粒由2~8分粒组成，偏光下可见黑十字。

土木香 Tumuxiang

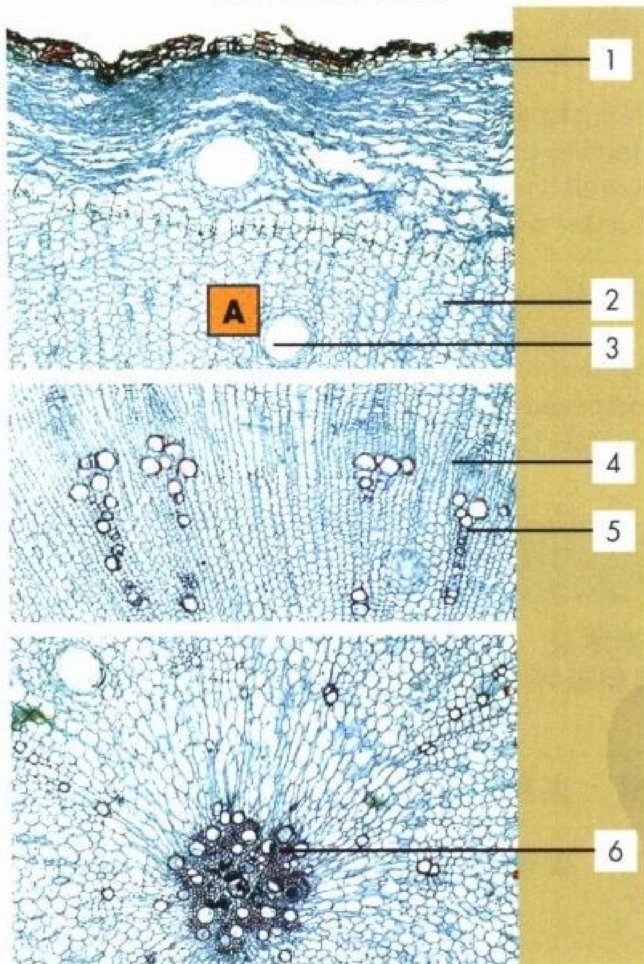


The dried root of *Inula helenium* L. (Fam. Asteraceae).
菊科植物土木香的干燥根。

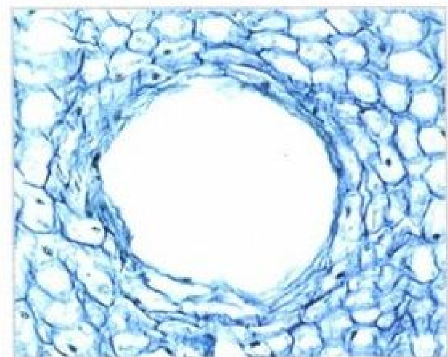
Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



Oil cavities
油室



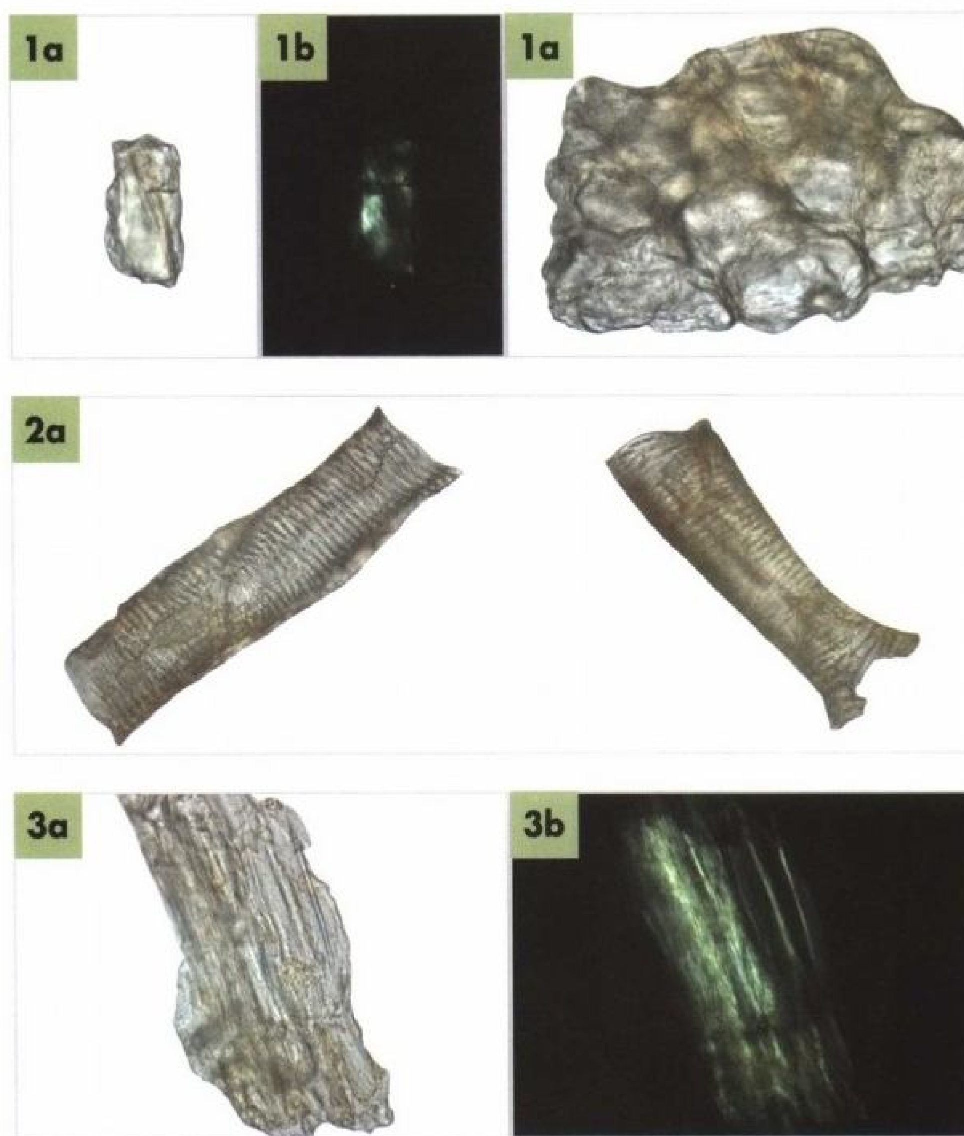
Transverse section of root

1. Cork	Several rows of cork cells.
2. Phloem	Broad; inulin in the parenchymatous cells.
3. Oil cavities	Distributed in phloem and xylem; about 80~300μm in diameter.
4. Cambium	Indistinct.
5. Xylem	Rays 6~25 rows of cell in width; vessels rare, singly scattered or several aggregated in groups; arranged radially.
6. Xylem fibres	Rare, xylem fibres in bundles present in surroundings of vessels at the centre of xylem.

根横切面组织图注

1. 木栓层	为数列木栓细胞。
2. 韧皮部	宽广，薄壁细胞含菊糖。
3. 油室	分布于韧皮部与木质部，直径80~300μm。
4. 形成层环	不甚明显。
5. 木质部	射线宽6~25列细胞；导管少，单个或数个成群，径向排列。
6. 木纤维	少数，成束存在于木质部中心的导管周围。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Inulin	Numerous, colorless, showing irregular fragments; visible under a polarizing microscope.
2. Vessels	Mainly reticulate vessels; 30~100μm in diameter.
3. Xylem fibres	Long fusiform; ends oblique; with oblique pits; visible under a polarizing microscope.

图注

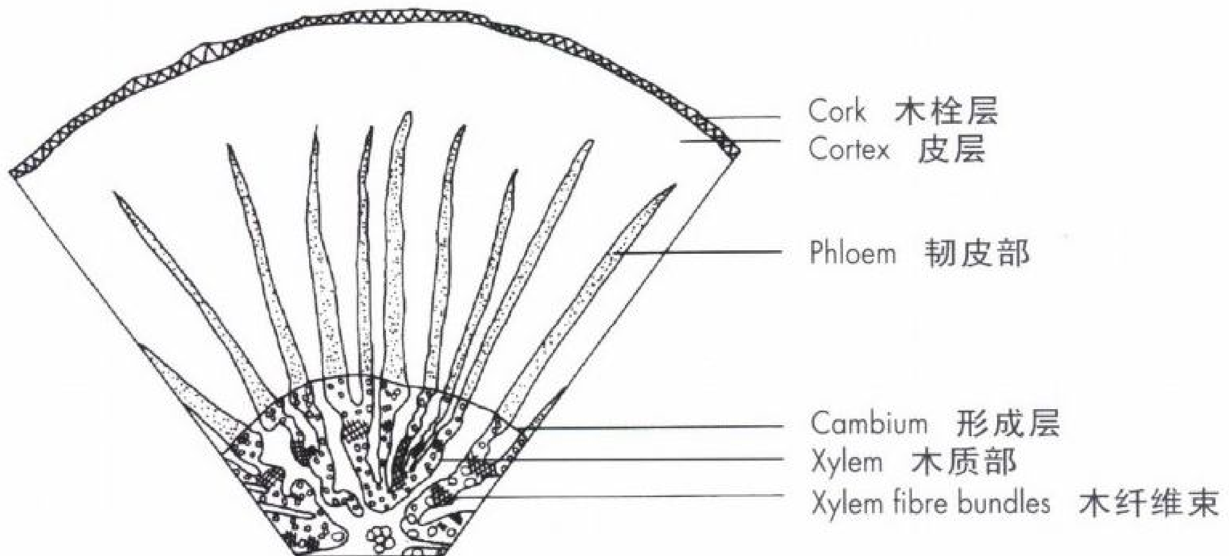
1. 菊糖	偏光下可见。众多，无色，呈不规则碎块状。
2. 导管	主为网纹导管，直径30~100μm。
3. 木纤维	偏光下可见。长梭形，末端倾斜，具斜纹孔。

板蓝根 Banlangen

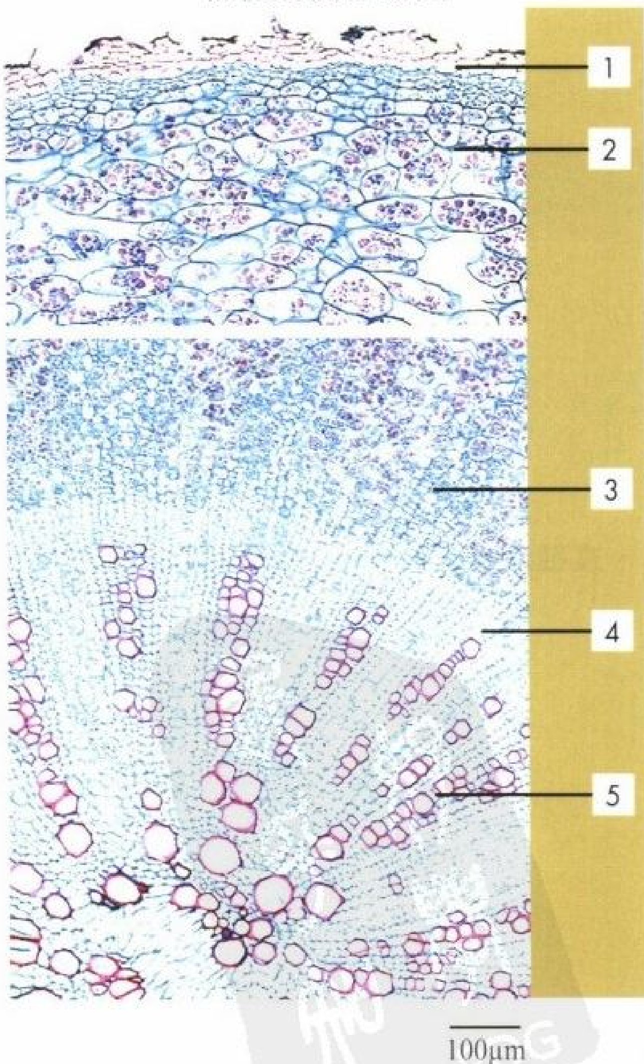


The dried root of *Isatis indigotica* Fort. (Fam. Cruciferae).
十字花科植物菘蓝的干燥根。

Sketch of transverse section of root
根横切面组织简图



Transverse section of root
根横切面组织图



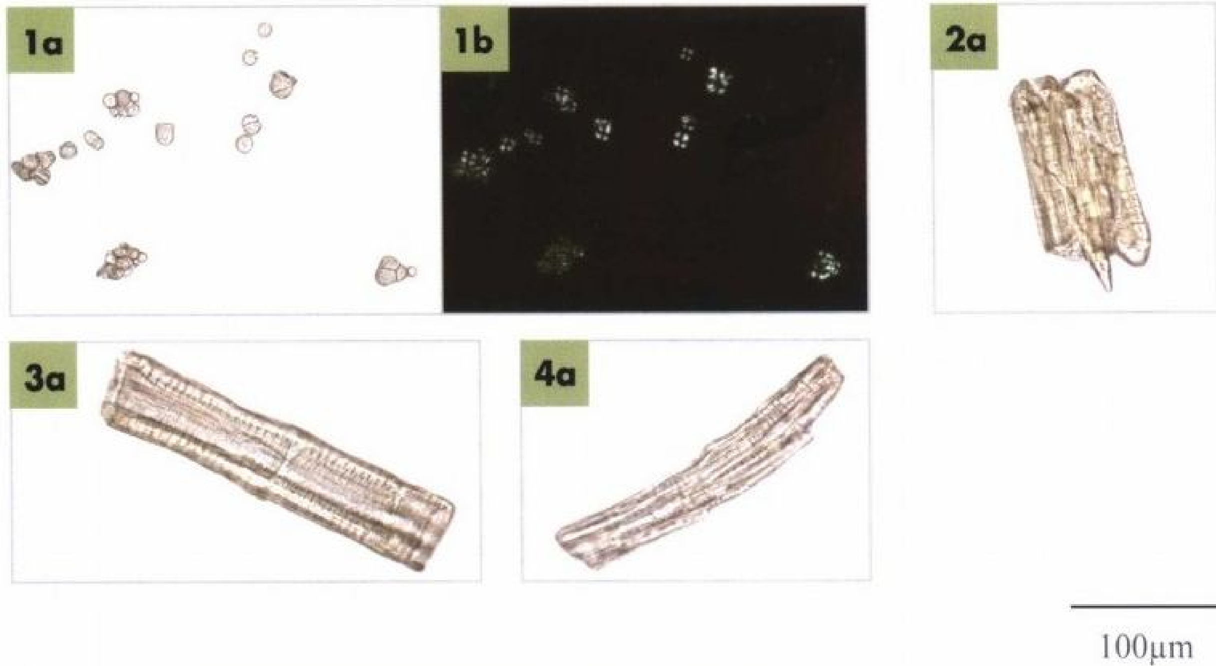
Transverse section of root

1. Cork	Consisting of several rows of cells.
2. Cortex	Narrow.
3. Phloem	Broad; with distinct rays.
4. Cambium	In a ring.
5. Xylem	Vessels yellow and subrounded; about up to 80μm in diameter; with xylem fibre bundles.
Parenchymatous cells	Containing starch granules.

根横切面组织图注

1. 木栓层	为数列细胞。
2. 皮层	窄。
3. 韧皮部	宽广，射线明显。
4. 形成层	成环。
5. 木质部	导管黄色，类圆形，直径约至80μm；有木纤维束。
薄壁细胞	含淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Simple granules; subrounded; 2~17μm in diameter; hilum distinct; dotted, short cracked in shape; most granules with faint striation and big ones dimly visible. Compound granules numerous; consisting of 2~5 components. Black, cruciate shape observed under a polarizing microscope.
2. Stone cells	Pale brown; subsquare, subrectangular or irregular shaped; slightly concavo-convex at brim; some slightly sharp at one top; 17~51μm in diameter and 20~77μm in length. Pit canals fine and relatively distinct; some relatively sparse at one side.
3. Vessels	Reticulate vessels; reticulate apertures relatively fine and short; bordered pitted vessels also observed.
4. Xylem fibres	Mostly in bundles or scattered singly; 14~20μm in diameter; slightly lignified; pits and pit canals distinct.

图注

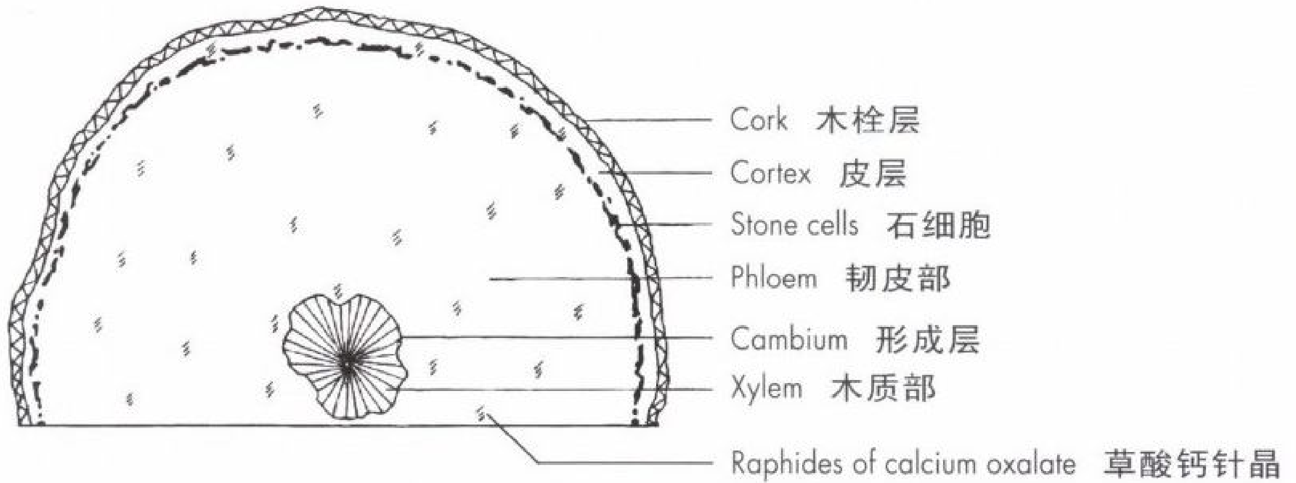
1. 淀粉粒	单粒，类圆形。直径2~17μm，脐点明显，点状、短缝状，层纹大多不明显，大粒隐约可见；复粒较多，由2~5分粒组成。偏光显微镜下可见黑十字现象。
2. 石细胞	淡棕色，呈类方形、类长方形或不规则形，边缘稍有凹凸，有的一断稍尖突，直径17~51μm，长20~77μm；孔沟细较明显，有的一边较稀疏。
3. 导管	网纹导管，网孔较细短，也有具缘纹孔导管。
4. 木纤维	多成束或单个散在，直径14~20μm，微木化，纹孔及孔沟明显。

巴戟天 Bajitian

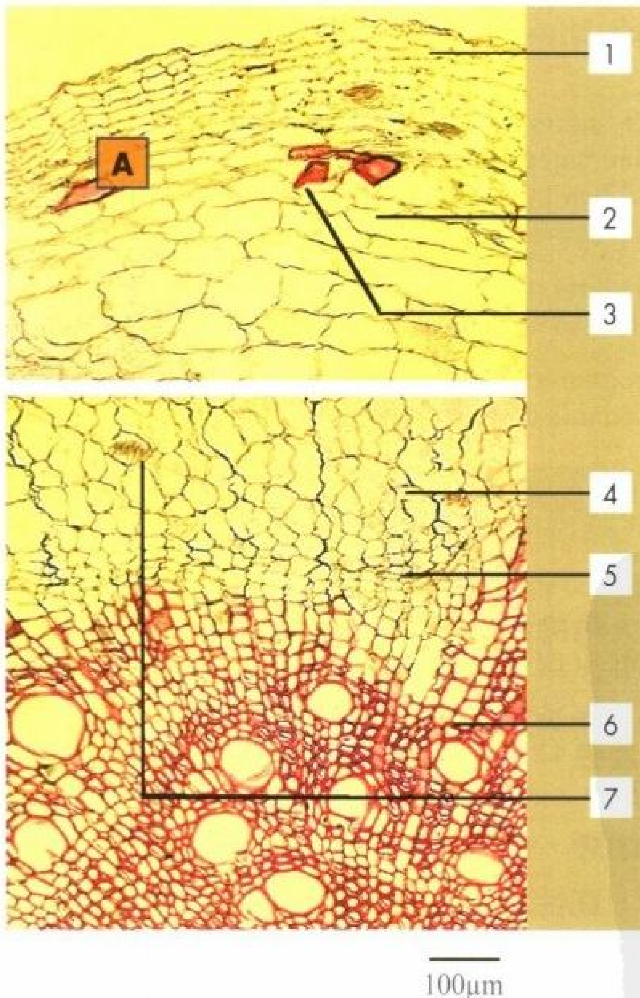


The dried root of *Morinda officinalis* How (Fam. Rubiaceae).
茜草科植物巴戟天的干燥根。

Sketch of transverse section of root 根横切面简图

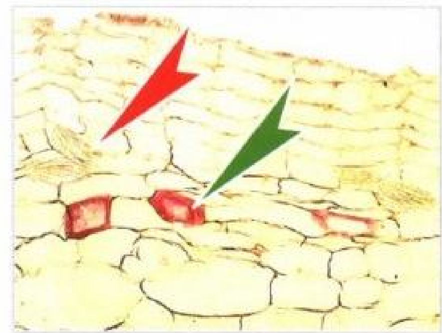


Transverse section of root 根横切面组织图



100μm

A Raphides "↗" and stone cells "↗" in the outer part of cortex 皮层外侧的针晶"↗"和石细胞"↗"



50μm

Parenchymatous cells containing raphides 薄壁细胞中含有针晶



50μm

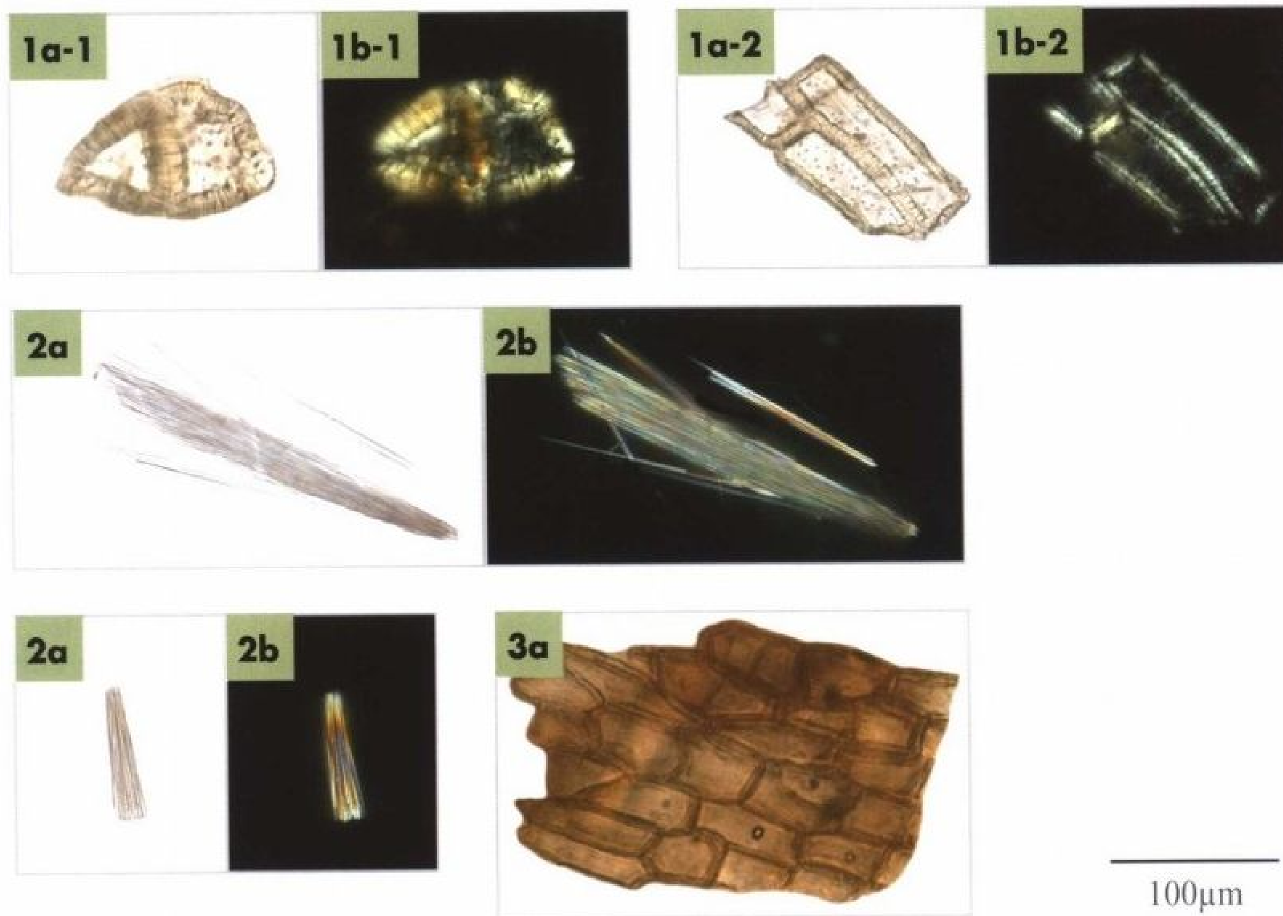
Transverse section of root

1. Cork	Consisting of several rows of cells; suberized.
2. Cortex	Stone cells single or in groups in the outer part of cortex; interruptedly arranged in a ring; parenchymatous cells containing raphides of calcium oxalate.
3. Stone cells	Subrounded, subsquare, subrectangular or irregular; single or in groups, arranged interruptedly in a ring.
4. Phloem	Broad; parenchymatous cells in the inner part containing raphides of calcium oxalate.
5. Cambium	Distinct.
6. Xylem	Vessels single scattered or 2~3 in groups; arranged radially; up to 100μm in diameter; xylem fibres developed; xylem rays 1~3 rows of cells wide.
7. Raphides of calcium oxalate	Mostly in bundles; distributing in parenchymatous cells.

根横切面组织图注

1. 木栓层	为数列细胞，木栓化。
2. 皮层	外侧石细胞单个或数个成群，断续排列成环；薄壁细胞含草酸钙针晶束。
3. 石细胞	类圆形、类方形、类长方形或不规则形，单个或数个成群，断续排列成环。
4. 韧皮部	宽广，内侧薄壁细胞含草酸钙针晶束。
5. 形成层	明显。
6. 木质部	导管单个散在或2~3个相聚，呈放射状排列，直径至100μm以上；木纤维发达；木射线宽1~3列细胞。
7. 草酸钙针晶	多成束存在于薄壁细胞中。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells	Numerous; varying in shape; subrounded, subsquare, subrectangular, strip-shaped or fusiform; with indistinct striation and distinct pits. Under a polarizing microscope; showing brightly orangish-red and polychromatic.
2. Raphides of calcium oxalate	Mostly in bundles; up to 184μm long; distributing in parenchymatous cells or fragmentarily scattered. Showing brightly orange and polychrome colour under a polarizing microscope.
3. Cork cells	Pale brown in color; subsquare or subpolygonal on the surface view.

图注

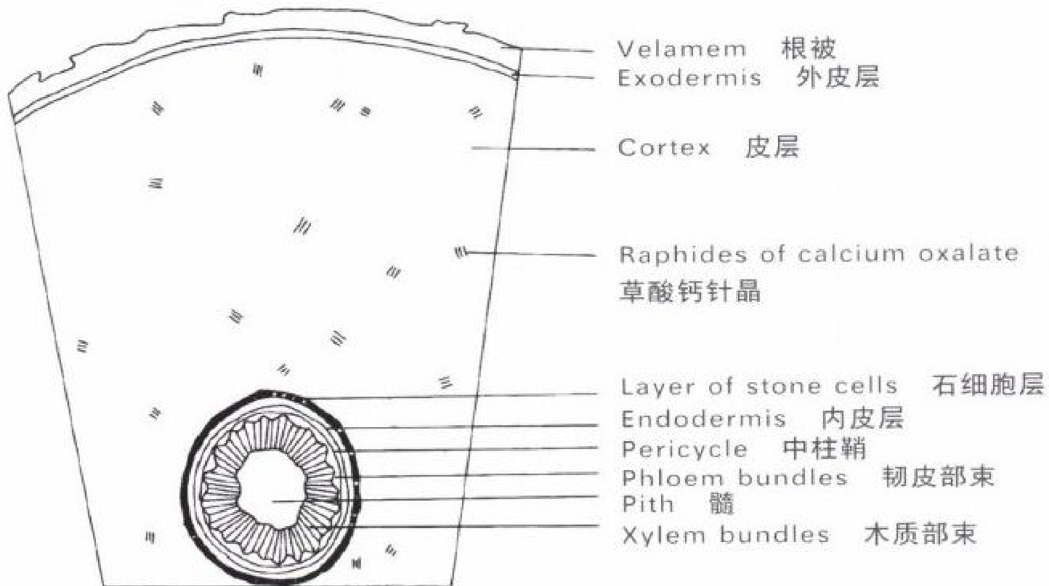
1. 石细胞	较多，形状不一，呈类圆形、类方形、类长方形、长条形或纺锤形，层纹隐约可见，纹孔明显。偏光显微镜下呈亮橙红色间多彩状。
2. 草酸钙针晶	常成束，长至184μm，存在于薄壁细胞中或碎断散生。偏光显微镜下呈亮橙黄色间多彩状。
3. 木栓细胞	淡棕色，表面观呈类方形或多角形。



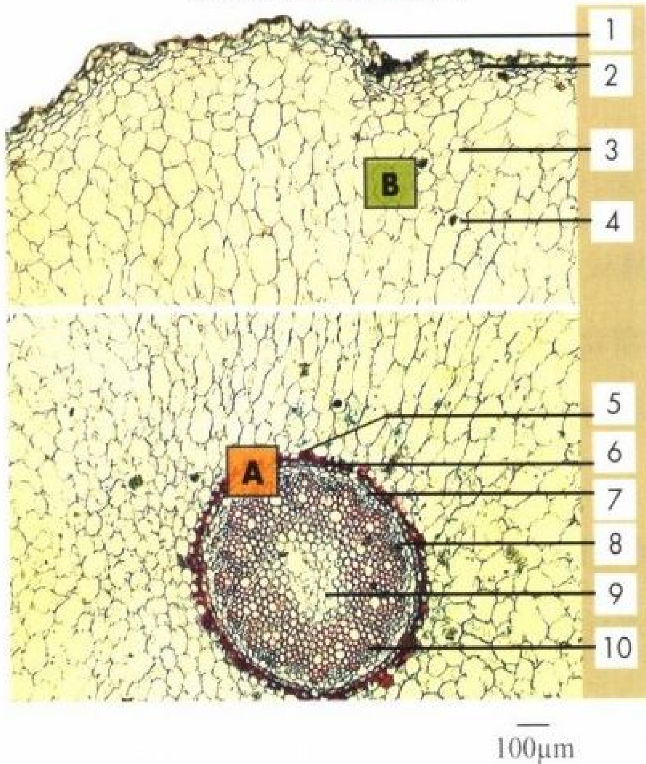
麦冬 Maidong

The dried root tuber of *Ophiopogon japonicus* (Thunb.) Ker-Gawl. (Fam. Liliaceae).
百合科植物麦冬的干燥块根。

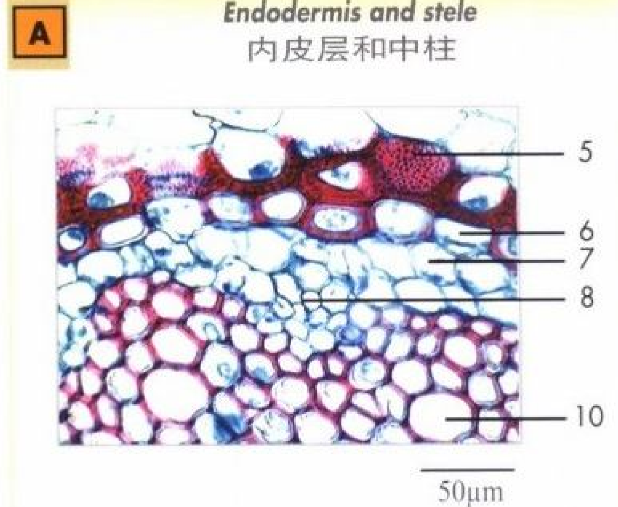
Sketch of transverse section of root tuber 块根横切面简图



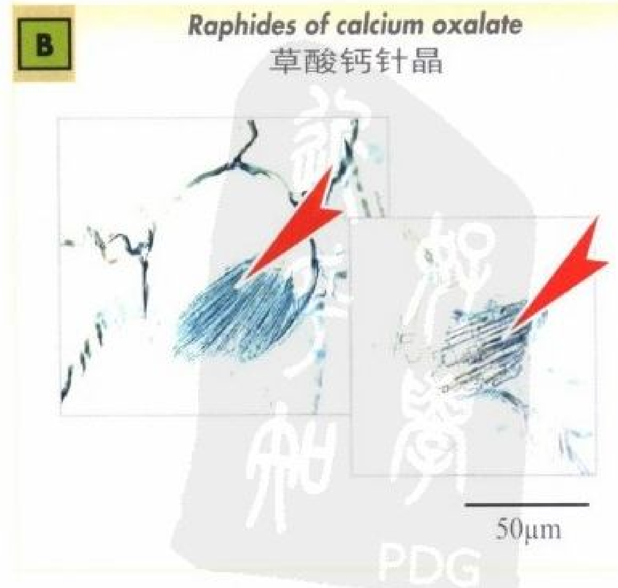
Transverse section of root tuber 块根横切面组织图



A Endodermis and stele 内皮层和中柱



B Raphides of calcium oxalate 草酸钙针晶



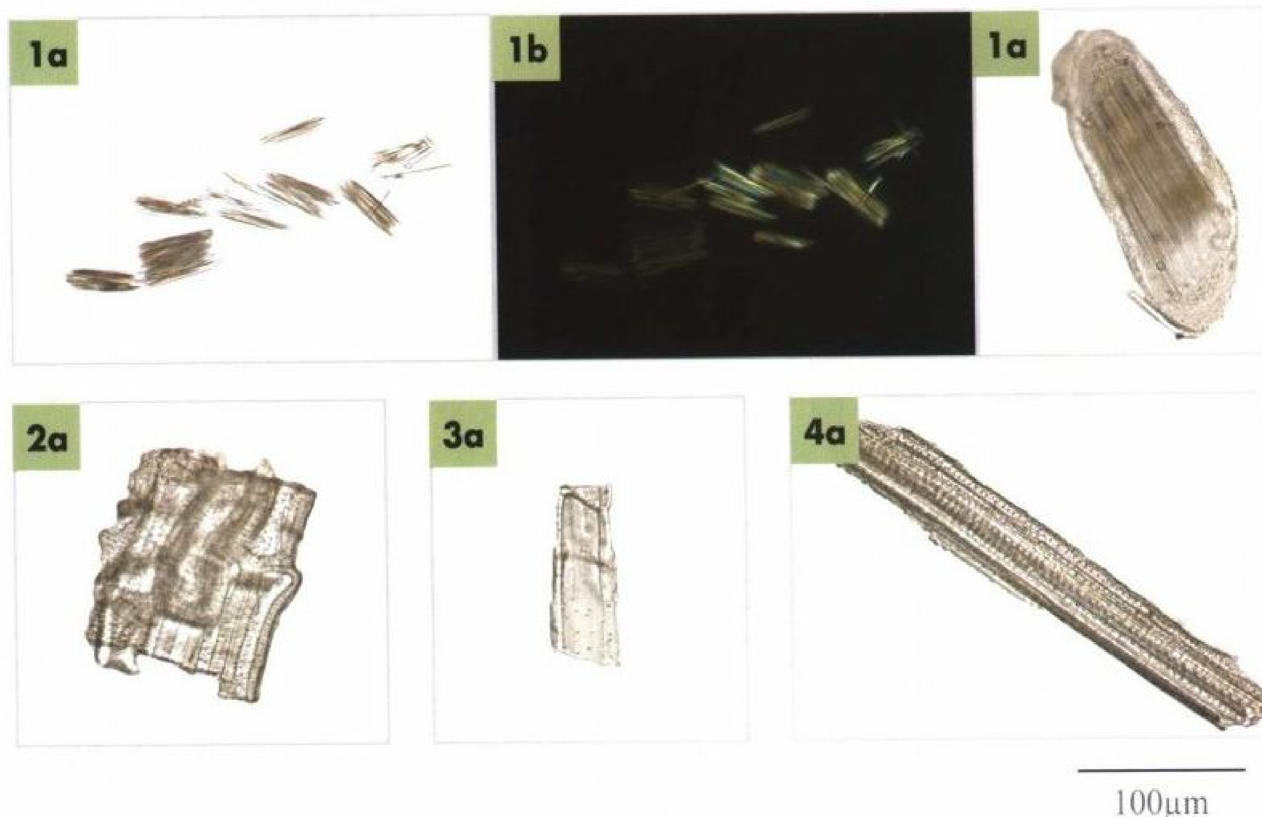
Transverse section of root tuber

1. Velamen	Consisting of 3~5 rows of lignified cells; with pits.
2. Exodermis	Outer walls slightly thickened; cells ususlly containing oil droplets.
3. Cortex	Broad, scattered with the mucilage cells containing raphides of calcium oxalate.
4. Raphides of calcium oxalate	Some raphides up to 10μm in diameter.
5. Stone cells layer	1 row; the inner and lateral walls thickened; with dense pits.
6. Endodermis	With evenly thickened and lignified walls; and with passage cells.
7. Pericycle	1~2 rows of parenchymatous cells.
8. Phloem bundles	16~22; located between the star-angles of the xylem bundles.
9. Pith	Small; parenchymatous cells subrounded.
10. Xylem bundles	16~22; vessels, tracheids, xylem fibres and internal lignified cells linking up to a ring.

块根横切面组织图注

1. 根被	3~5列木化细胞，具纹孔。
2. 外皮层	外壁稍厚，细胞内常含油滴。
3. 皮层	宽广，散有含草酸钙针晶束的黏液细胞。
4. 草酸钙针晶束	有的直径至10μm。
5. 石细胞层	1列，其内壁及侧壁增厚，纹孔细密。
6. 内皮层	细胞壁均匀增厚，木化，有通道细胞。
7. 中柱鞘	1~2列薄壁细胞。
8. 韧皮部束	16~22个，各位于木质部束的星角间。
9. 髓	小，薄壁细胞类圆形。
10. 木质部束	16~22个，由导管、管胞、木纤维及内侧木化细胞连结成环状。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Raphides of calcium oxalate	Abundant, in bundles or scattered; some located in subrounded; elliptical mucilage cells; 25~50μm long; some wider and longer; up to 80μm long. Brightly orangeseparated by polychrome in color observed under a polarizing microscope.
2. Stone cells	Usually in groups; colorless. Subsquare or rectangular; pits dense; flat ellipsoid or short slit-shaped.
3. Endodermis cells	Rectangular or strip-shaped; pit canals distinct; pits dotted.
4. Xylem fibres	Slender; ends oblique; pits cruciate or V-shaped.

图注

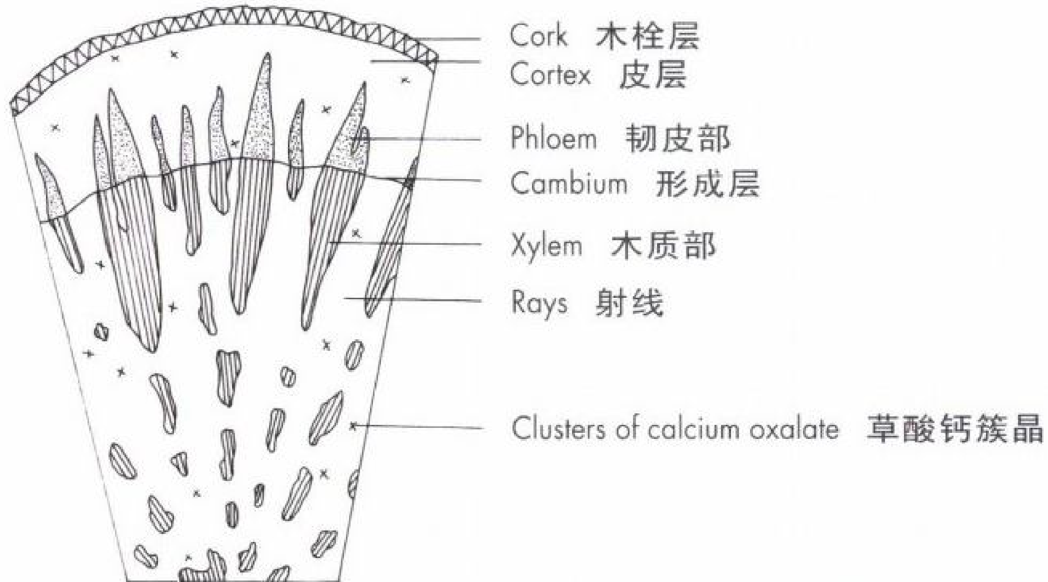
1. 草酸钙针晶	较多，成束或散在，有的存在于类圆形、椭圆形黏液细胞中，长25~50μm，另有较粗长者，长至80μm。偏光显微镜下呈亮橙黄间多彩色。
2. 石细胞	常成群，无色。类方形或长方形，纹孔密，扁椭圆形或短裂缝状。
3. 内皮层细胞	长方形或长条形，孔沟明显，纹孔点状。
4. 木纤维	细长，末端倾斜，纹孔十字形或人字形。

赤芍 Chishao

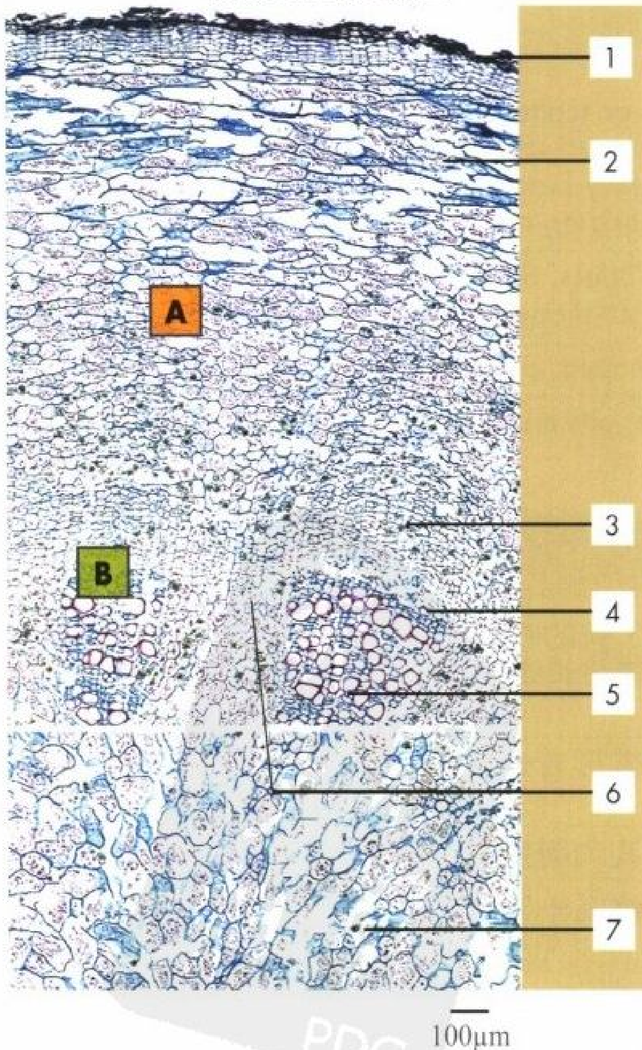


The dried root of *Paeonia lactiflora* Pall. (Fam. Ranunculaceae).
毛茛科植物芍药的干燥根。

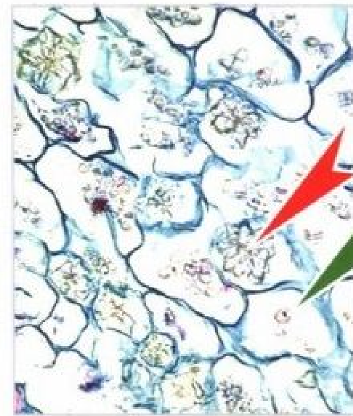
Sketch of transverse section of root 根横切面简图



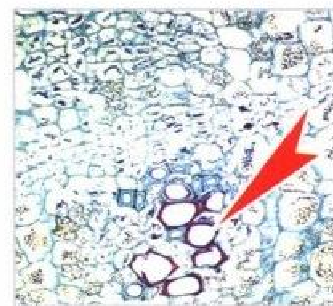
Transverse section of root 根横切面组织图



A *Parenchymatous cells containing clusters of calcium oxalate " " and starch granules " "*
薄壁细胞中含有草酸钙簇晶" "和淀粉粒" "



B *Vascular bundle* 维管束



Transverse section of root

1. Cork	Several rows of brown cells.
2. Cortex	Parenchymatous cells elongated tangentially
3. Phloem	Relatively narrow.
4. Cambium	In a ring.
5. Xylem	Relatively broad rays, vessels groups arranged radially, and accompanied by xylem fibres.
6. Ray	Broad.
7. Parenchymatous cells	Containing clusters of calcium oxalate and starch granules.

根横切面组织图注

1. 木栓层	为数列棕色细胞。
2. 皮层	薄壁细胞切向延长。
3. 韧皮部	较窄。
4. 形成层	成环。
5. 木质部	射线较宽，导管群作放射状排列，导管旁有木纤维。
6. 射线	宽。
7. 薄壁细胞	含草酸钙簇晶，并含淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Cork cells	Pale brown; strip-shaped, rectangular or polygonal on the surface view; with slightly thickened walls; straight or slightly undulant curved.
2. Xylem fibers	Nearly colorless; in bundles; long-fusiform, end obliquely pointed; pit aperture obliquely cleft; some relatively wide and crossed to cruciate in shape.
3. Clusters of calcium oxalate	Numerous, scattered or located in parenchyma; usually several or 10 more arranged in a row longitudinally. Brightly polychrome observed under a polarizing microscope.
4. Starch granules	Abundant, simple granules oval-rounded; longrounded or subrounded; with indistinct hilum and striation. Black, cruciate in shape observed under a polarizing microscope.
5. Vessels	Mainly bordered pitted vessels; 25~78μm in diameter; bordered pits elliptical; elongated transversely; reticulate vessels existed.

图注

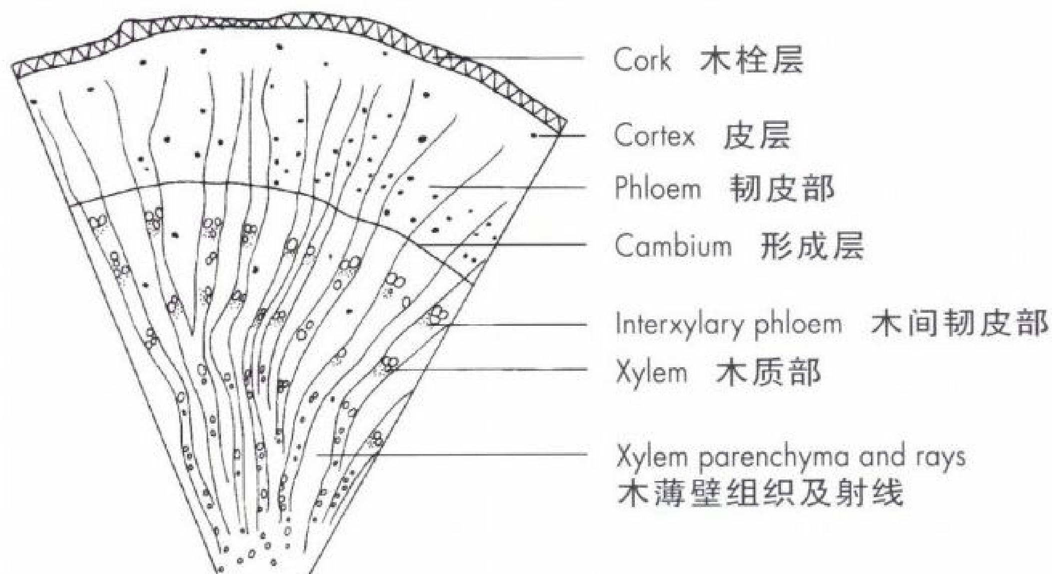
1. 木栓细胞	淡棕色，表面观呈长条形、长方形或多角形，壁稍厚，平直或稍微波状弯曲。
2. 木纤维	几无色，成束，长梭形，末端斜尖、纹孔口斜裂缝状，也有纹孔口较宽并相交成十字形。
3. 草酸钙簇晶	众多，散在或存在于薄壁组织中，常数个至数十个纵向排列成行。偏光显微镜下呈多彩色。
4. 淀粉粒	较多。单粒卵圆形、长圆形或类圆形，脐点及层纹均不明显。偏光显微镜下可见黑十字现象。
5. 导管	主为具缘纹孔导管，直径25~78μm，具缘纹孔椭圆形，横向延长；另有网纹导管。

华山参 Huashanshen

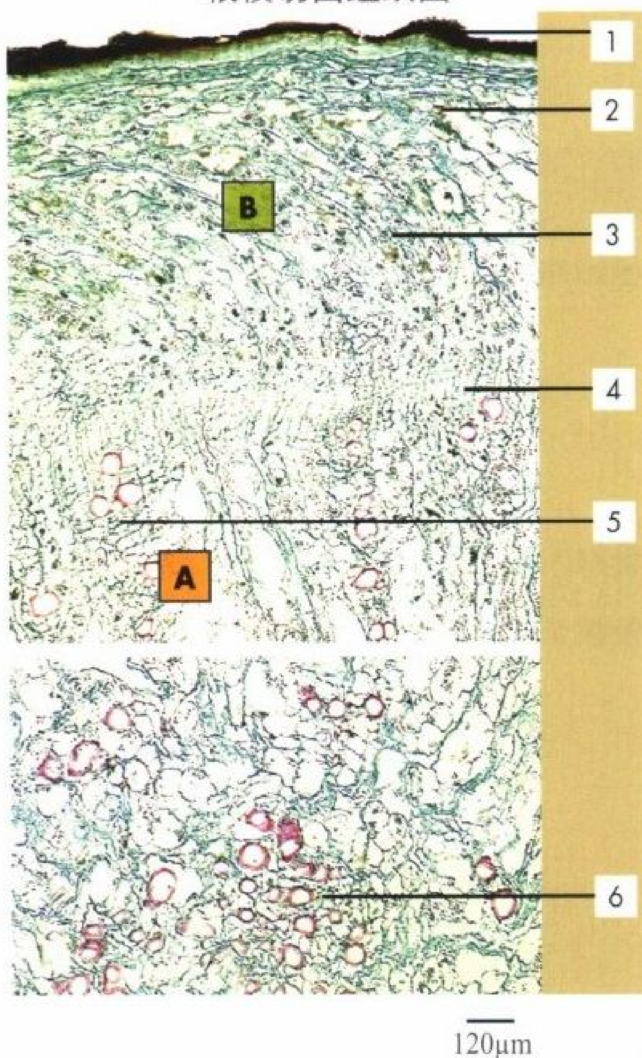


The dried root of *Physochlaina infundibularis* Kuang (Fam. Solanaceae).
茄科植物漏斗泡囊草的干燥根。

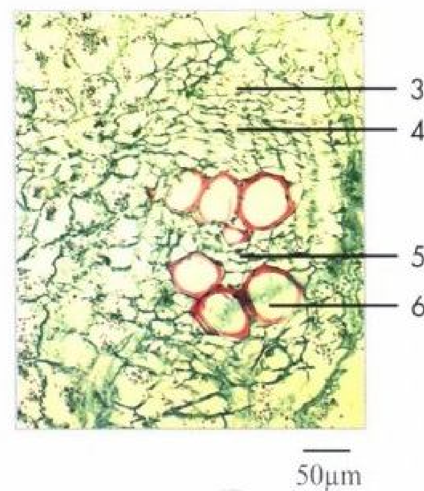
Sketch of transverse section of root
根横切面简图



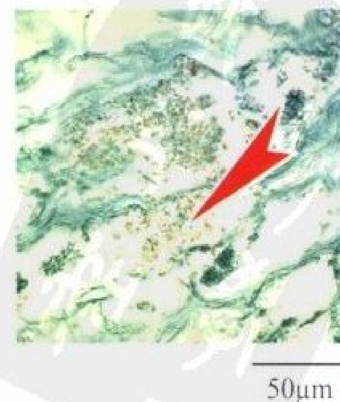
Transverse section of root
根横切面组织图



A *Vascular bundles*
维管束



B *Cells containing sandy crystals*
细胞中含有砂晶



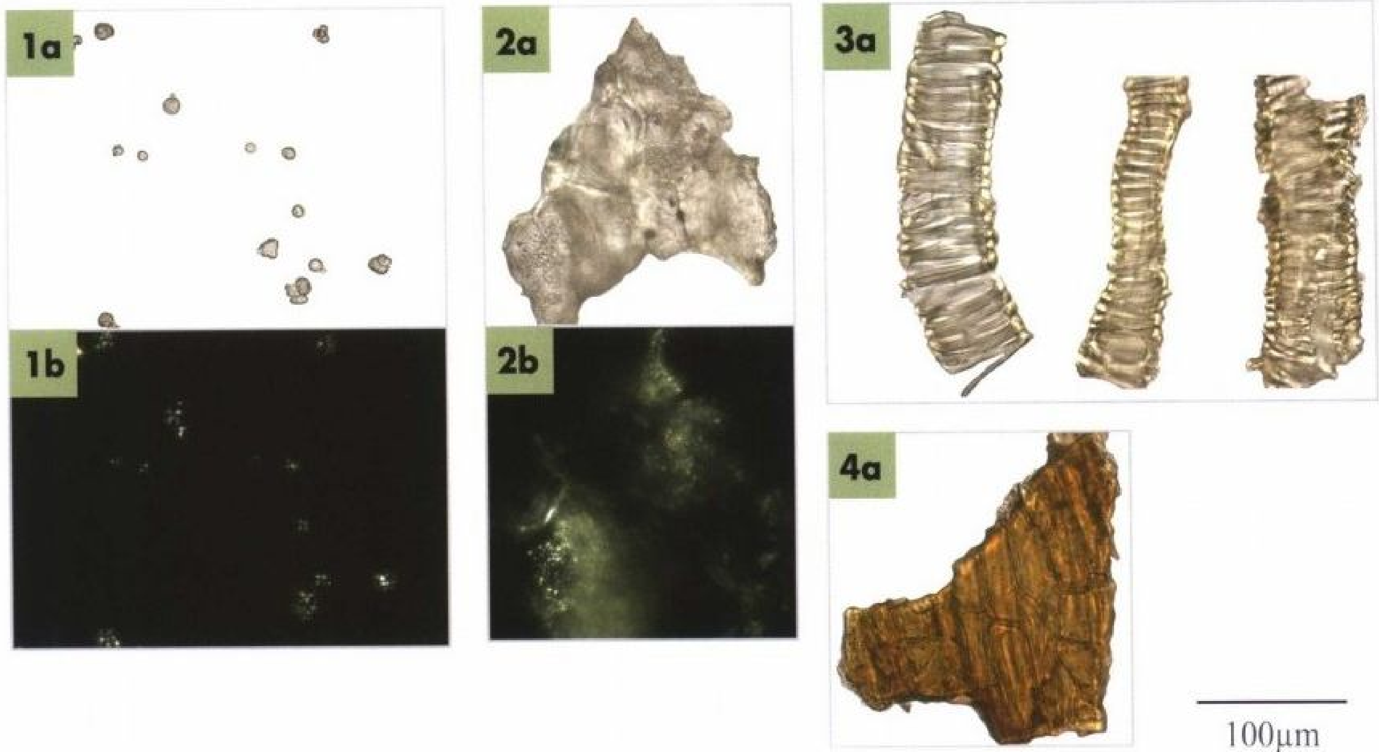
Transverse section of root

1. Cork	Consisting of several to over 10 layers of cork cells; the outermost cells yellowish-brown.
2. Cortex	Relatively narrow.
3. Phloem	Containing sandy crystal cells.
4. Cambium	In a ring.
5. Interxylary phloem	Vessels accompanied by fine sieve tube groups.
6. Xylem	Occupying the majority of root; several vessels grouped; some vessels accompanied by fine sieve tube groups.
Xylem parenchyma and rays	Containing sandy crystal cells.

根横切面组织图注

1. 木栓层	为数列至十余列木栓细胞，最外层细胞黄棕色。
2. 皮层	较窄。
3. 韧皮部	有含砂晶细胞。
4. 形成层	成环。
5. 木间韧皮部	在导管旁有细小筛管群。
6. 木质部	占根的大部分，导管数个相聚，有的导管旁有细小筛管群。
木薄壁细胞及射线	有含砂晶细胞。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Numerous, simple granules subrounded or semicircular; 3~15μm in diameter; hilum dotted; cleft or cruciate; compound granules composed of 2~4 components. Black, cruciate shape observed under a polarizing microscope.
2. Sandy crystals of calcium oxalate	Numerous; occurring in parenchymatous cells. Brightly yellowish-white in color observed under a polarizing microscope.
3. Vessels	Reticulate vessels; 17~85μm in diameter.
4. Cork cells	Brownish-yellow, rectangular or irregular shape.

图注

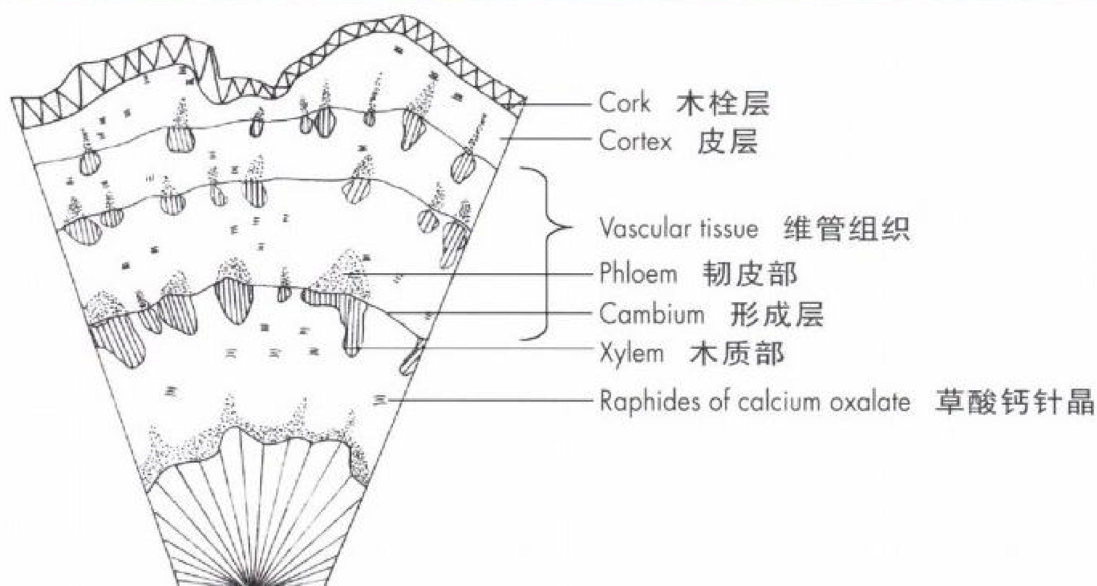
1. 淀粉粒	甚多，单粒类圆形或半圆形，直径3~15μm，脐点点状、裂缝状或叉状；复粒由2~4分粒组成。偏光显微镜下呈黑十字现象。
2. 草酸钙砂晶	众多，存在于薄壁细胞中。偏光显微镜下呈亮黄白色。
3. 导管	网纹导管，直径17~85μm。
4. 木栓细胞	棕黄色，长方形或不规则形。



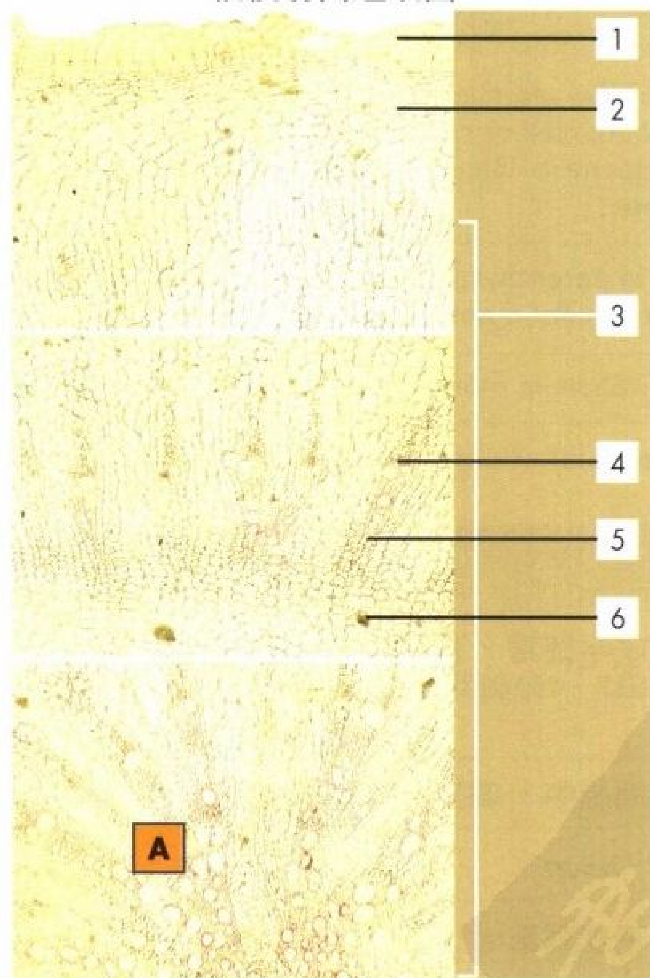
商陆 Shanglu

The dried root of *Phytolacca acinosa* Roxb. (Fam. Phytolaccaceae).
商陆科植物商陆的干燥根。

Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



A Raphides of calcium oxalate
草酸钙针晶



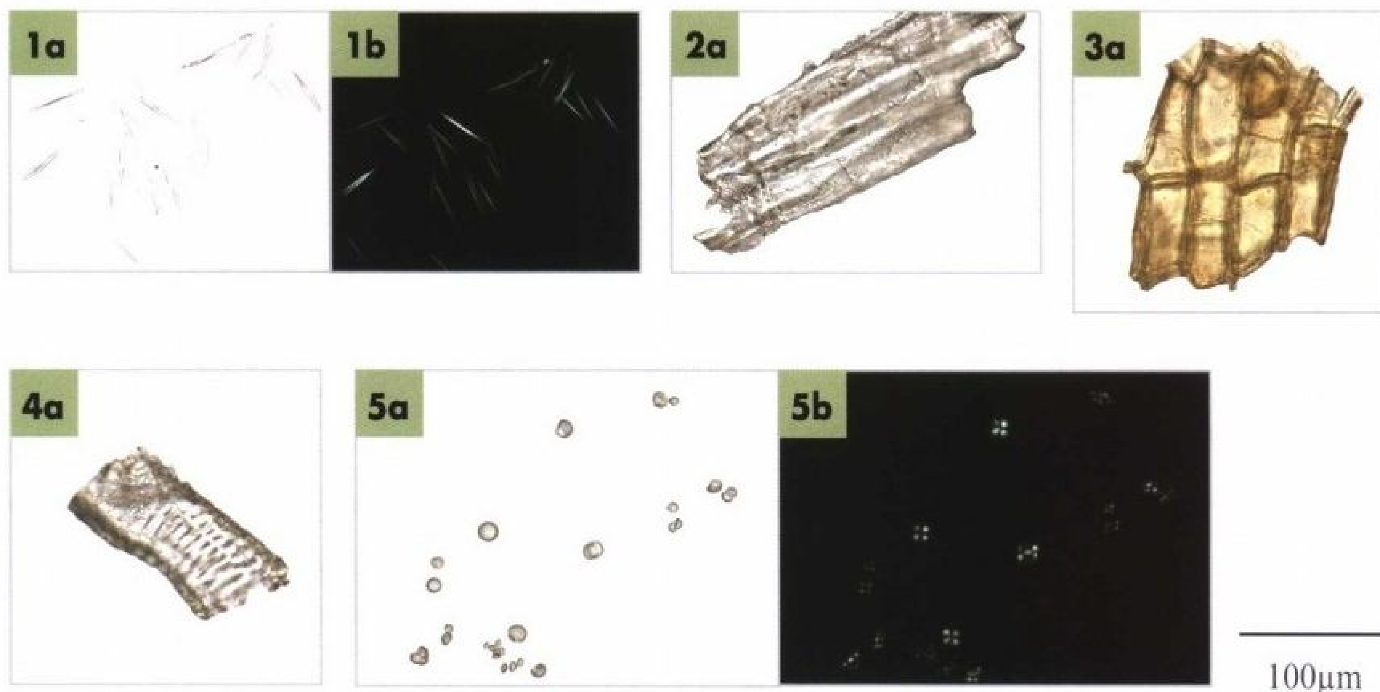
Transverse section of root

1. Cork	Cells consisting of several to over 10 rows of cells.
2. Cortex	Relatively narrow.
3. Vascular tissue	With tertiary structure; with several concentric cambium rings; each having dozens of vascular bundles.
4. Vascular bundles	Open collateral vascular bundles.
5. Xylem fibres	Numerous; usually several ones connected or surrounding the vessels.
6. Parenchymatous cells	Containing raphides of calcium oxalate; with few prisms or clusters of calcium oxalate, and containing starch granules.

根横切面组织图注

1. 木栓层	细胞数列至10余列。
2. 皮层	较窄。
3. 维管组织	具有三生构造，有数层同心性形成层环，每环有几十个维管束。
4. 维管束	无限外韧型。
5. 木纤维	多，常数个相连或围于导管周围。
6. 薄壁细胞	含草酸钙针晶束，有少数草酸钙方晶或簇晶，并含淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Crystals of calcium oxlate	Mainly raphides; in bundles or scattered; 40~72μm long; brightly yellowish-white color observed under a polarizing microscope.
2. Xylem fibres	Mostly in bundles or scattered; 10~20μm in diameter; cruciate pits visible.
3. Cork cells	Pale brownish-yellow; rectangular or polygonal; some containing granular masses.
4. Vessels	Mainly reticulate vessels.
5. Starch granules	Simple granules subrounded or longrounded; 3~28μm in diameter; hilum short fissure-shaped dotted, satellate and V-shaped; striations indistinct. Compound granules few; composed of 2~3 components. Black, cruciate shape observed under a polarizing microscope.

图注

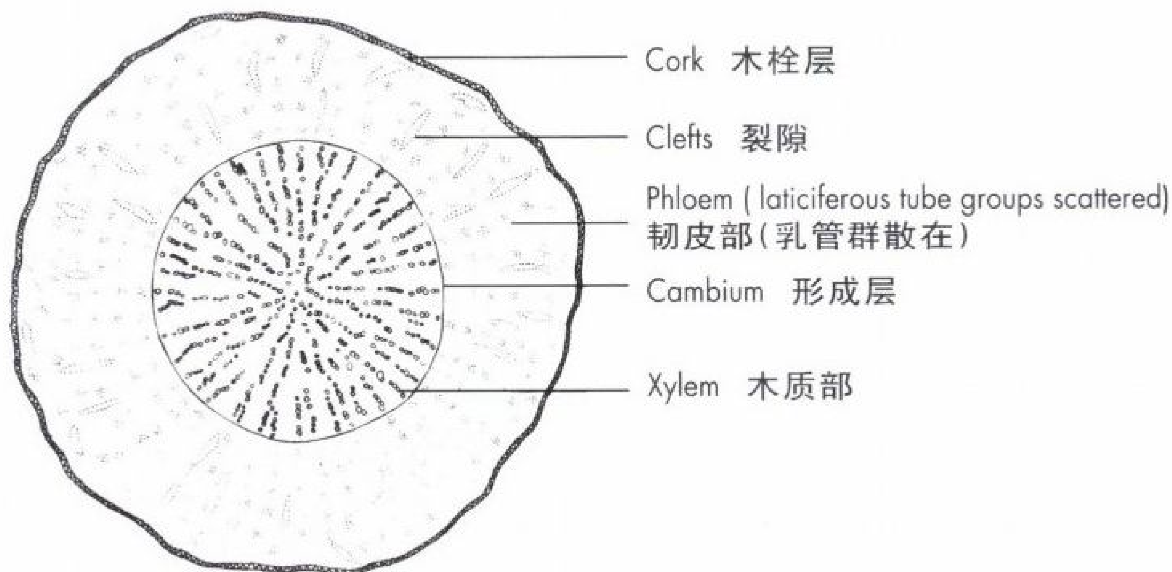
1. 草酸钙结晶	主为针晶，成束或散在，长40~72μm；偏光显微镜下呈亮黄白色。
2. 木纤维	多成束或散在，直径10~20μm，可见十字形纹孔。
3. 木栓细胞	淡棕黄色，长方形或多角形，有的含颗粒状物。
4. 导管	主为网纹导管。
5. 淀粉粒	单粒类圆形或长圆形，直径3~28μm，脐点短缝状、点状、星状和人字形，层纹不明显；复粒少数，由2~3分粒组成。偏光显微镜下可见黑十字现象。

桔 梗 Jiegeng

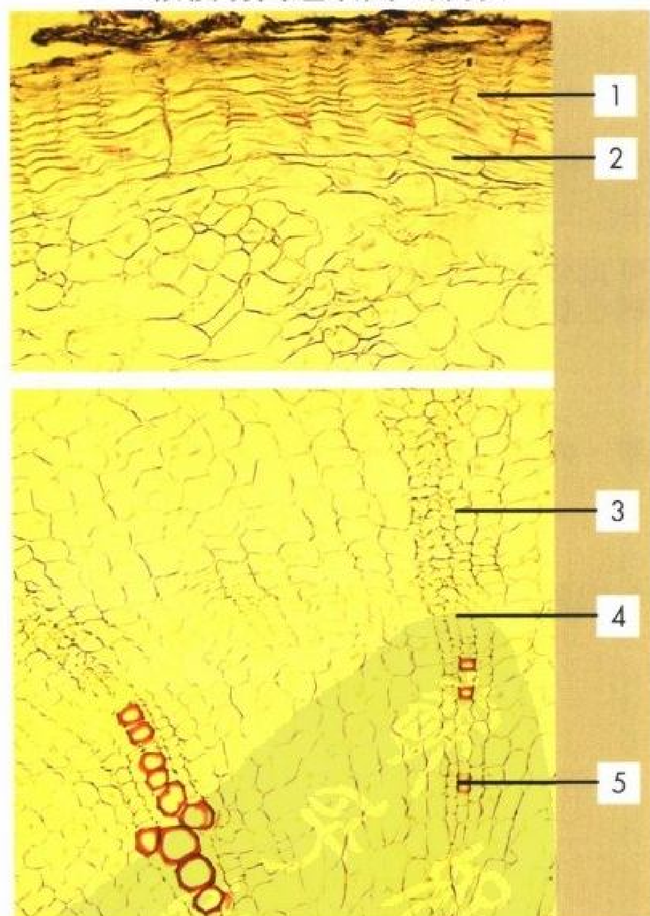


The dried root of *Platycodon grandiflorum* (Jacq.) A. DC. (Fam. Campanulaceae).
桔梗科植物桔梗的干燥根。

Sketch of transverse section of root 根横切面简图



Transverse section of root (partial) 根横切面组织图（部分）



Transverse section of root

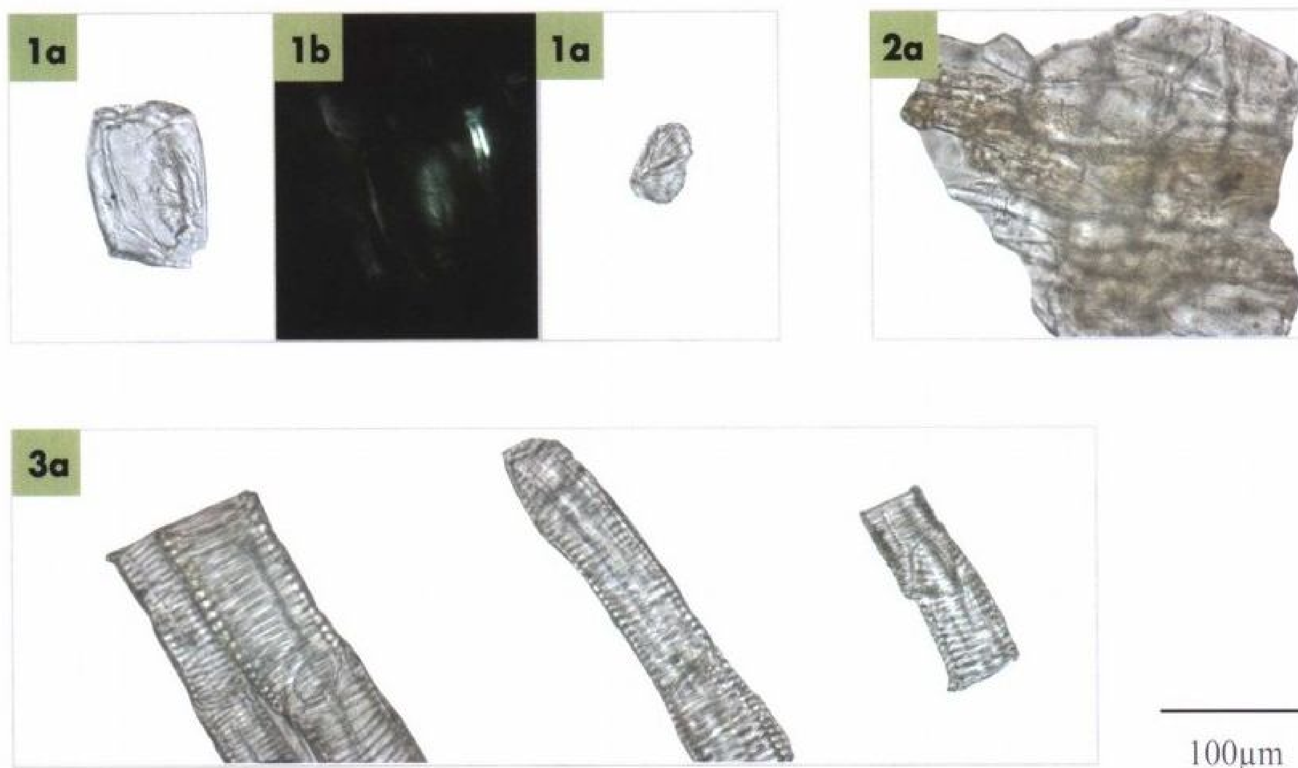
1. Cork	Relic cork cells observed in commercial material medica removed of outer bark; cork layers observed in the ones with outer bark; containing small prisms of calcium oxalate in cells.
2. Cortex	Narrow, usually showing clefts.
3. Phloem	Laticiferous tube groups scattered, with slightly thick walls, and containing fine granular yellowish-brown contents.
4. Cambium	In a ring.
5. Xylem	Vessels singly scattered or severally grouped, arranged radially.
Parenchymatous cells	Containing inulin.

根横切面组织图注

1. 木栓层	商品药材去外皮者可见残存的木栓细胞；未去外皮者有木栓层，细胞中含草酸钙小棱晶。
2. 皮层	窄，常见裂隙。
3. 韧皮部	乳管群散在，壁略厚，内含微细颗粒状黄棕色物。
4. 形成层	成环。
5. 木质部	导管单个散在或数个相聚，呈放射状排列。
薄壁细胞	含有菊糖。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Inulin	Numerous. Inulin masses fan-shaped or irregularly shaped, mostly scattered in parenchymatous cells. Visible under a polarizing microscope.
2. Laticiferous tubes	Articulate laticiferous tubes, slightly thick-walled, lateral side attaching to another laticiferous tube connected by short chains of cells. Laticiferous tube containing fine granular yellowish-brown contents.
3. Vessels	Scalariform, reticulate and bordered pitted vessels, vessel elements short.

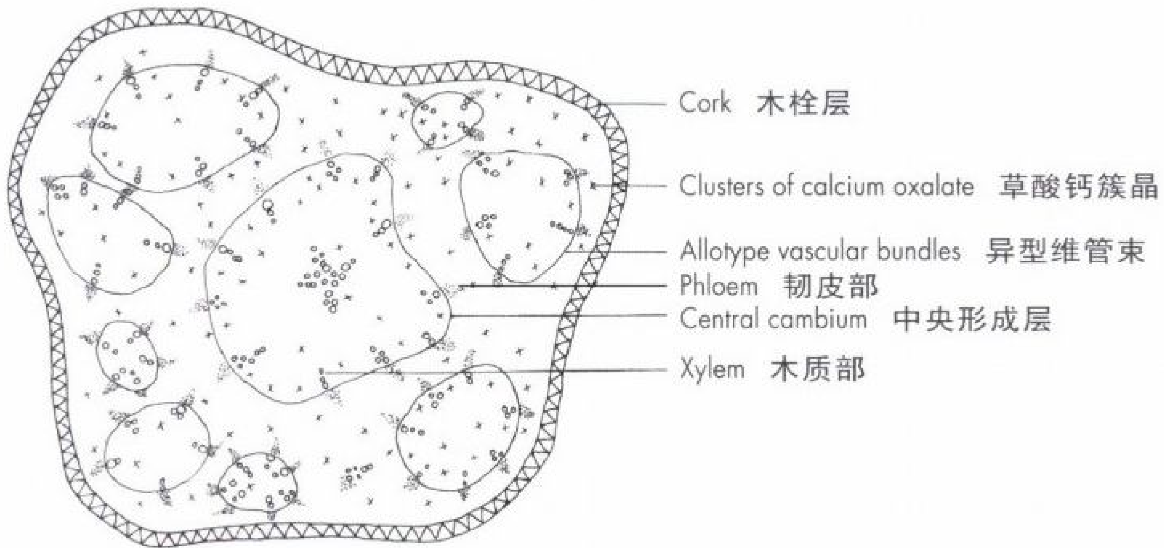
图注

1. 菊糖	极多。菊糖团块呈扇形或不规则形，多散在于薄壁细胞中。偏光下可见。
2. 乳汁管	为有节乳汁管，壁略厚，侧面由短的细胞与另一乳汁管联结成网状，乳汁管中含有微细颗粒状黄棕色物。
3. 导管	梯纹、网纹及具缘纹孔导管，导管分子较短。

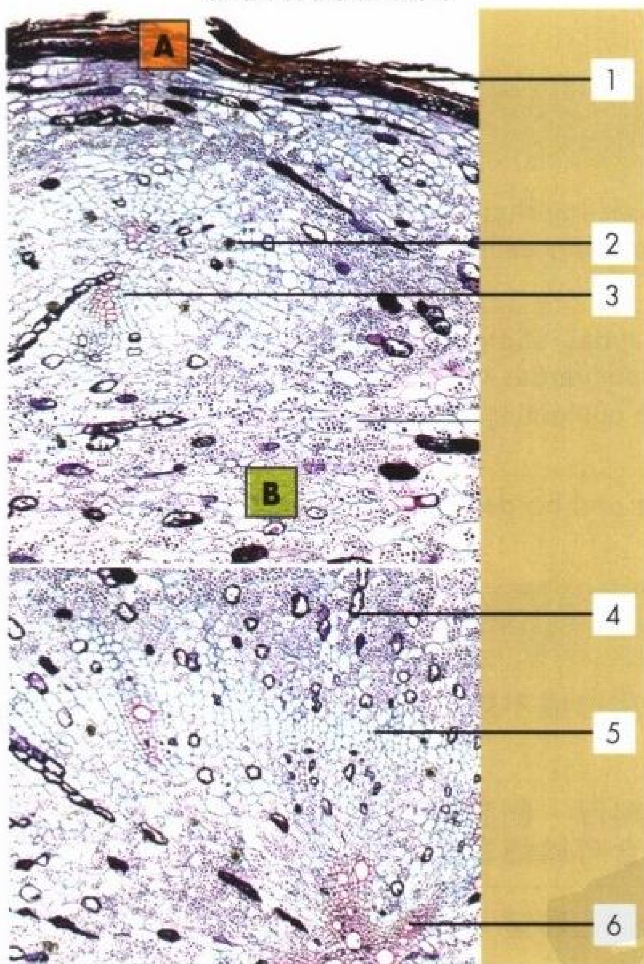
何首乌 Heshouwu

The dried root tuber of *Polygonum multiflorum* Thunb. (Fam. Polygonaceae).
蓼科植物何首乌的干燥块根。

Sketch of transverse section of root tuber 块根横切面简图



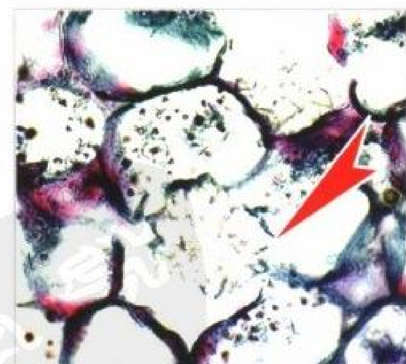
Transverse section of root tuber 根横切面组织图



A *Cork* 木栓层



B *Clusters of calcium oxalate* 草酸钙簇晶



Transverse section of root tuber

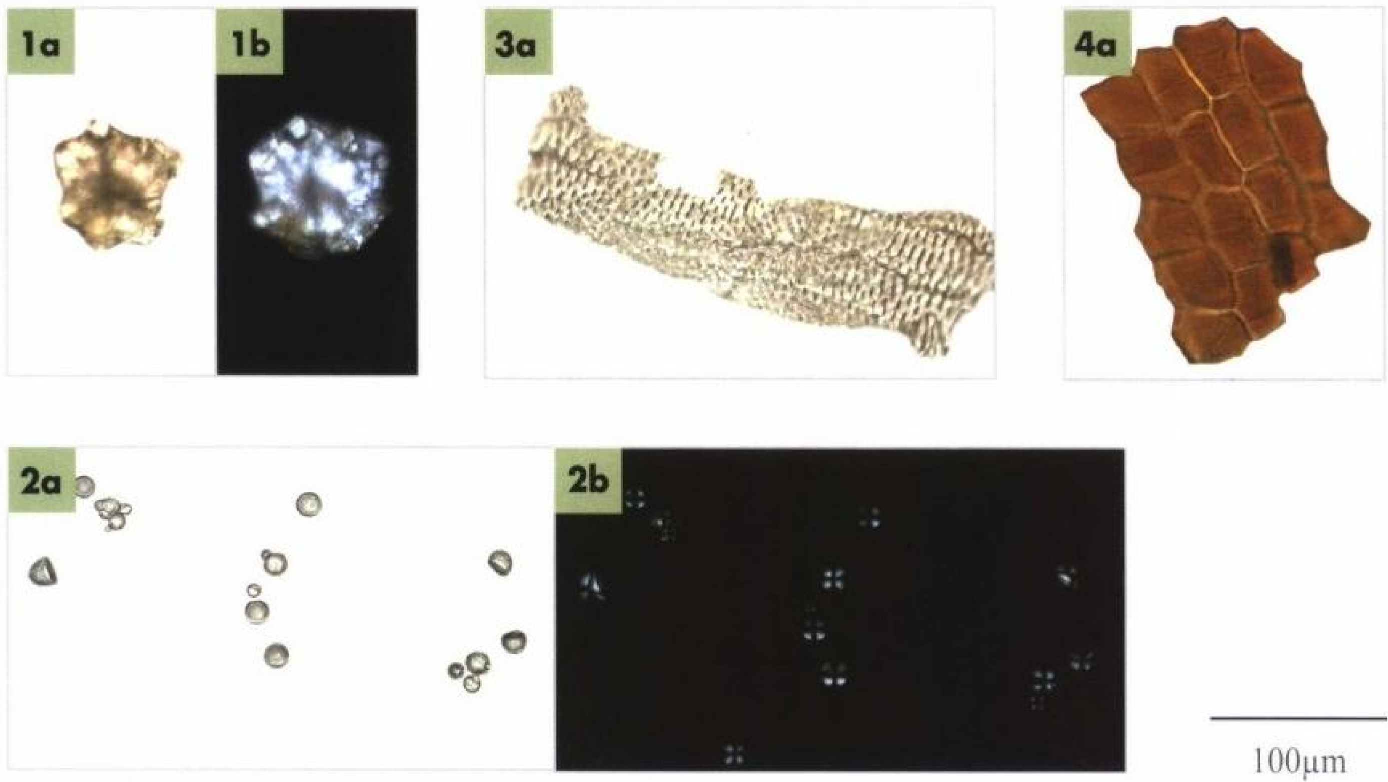
1. Cork	Containing several rows of cells; filled with brown contents.
2. Clusters of calcium oxalate	Numerous; distributing in the parenchymatous cells of cortex.
3. Allotype vascular bundles	Collateral type; vessels rare.
4. Phloem	Relatively broad; scattered with 4~11 subrounded heterotypical vascular bundles.
5. Central cambium	In the form of a ring.
6. Xylem	Vessels rare; surrounded by some tracheids and few xylem fibres.

块根横切面组织图注

1. 木栓层	为数列细胞，充满棕色物。
2. 草酸钙簇晶	较多，分布于皮层薄壁细胞中。
3. 异型维管束	为外韧型，导管较少。
4. 韧皮部	较宽，散有类圆形异型维管束4～11个。
5. 中央形成层	成环状。
6. 木质部	导管稀少，周围有管胞及少数木纤维。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Clusters of calcium oxalate	Abundant; 14~129µm in diameter; and clusters jointed with large prism occasionally found. Brightly orange in color observed under a polarizing microscope.
2. Starch granules	Numerous. Simple starch granules subrounded; 3~81µm in diameter; hilum V-shaped, stellate or Y-shaped; striations of large ones may be seen indistinctly; compound granules composed of 2~9 components. Black and cruciate shape observed under a polarizing microscope.
3. Vessels	Mainly bordered pitted vessels; 12~118µm in diameter and short.
4. Cork cells	Polygonal on the surface view; filled with yellowish-brown contents in the lumina.

图注

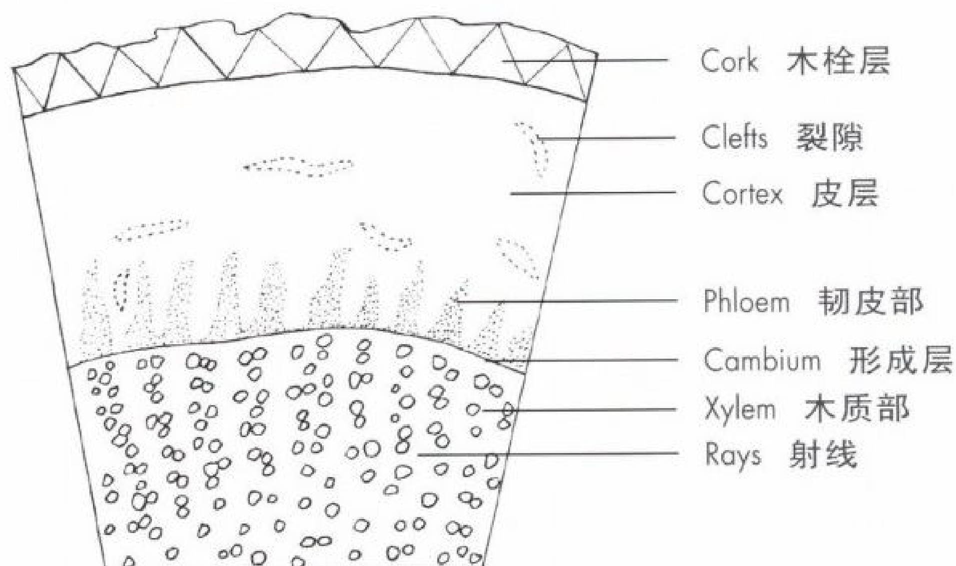
1. 草酸钙簇晶	较多，直径14~129µm，偶见簇晶与较大的方晶合生。偏光显微镜下呈亮橙黄色。
2. 淀粉粒	极多。单粒类圆形，直径3~81µm，脐点人字形、星状或三叉状，大粒者隐约可见层纹；复粒由2~9分粒组成。偏光显微镜下呈黑十字状。
3. 导管	主为具缘纹孔导管，直径12~118µm，导管分子短。
4. 木栓细胞	表面观类多角形，胞腔内充满黄棕色物。



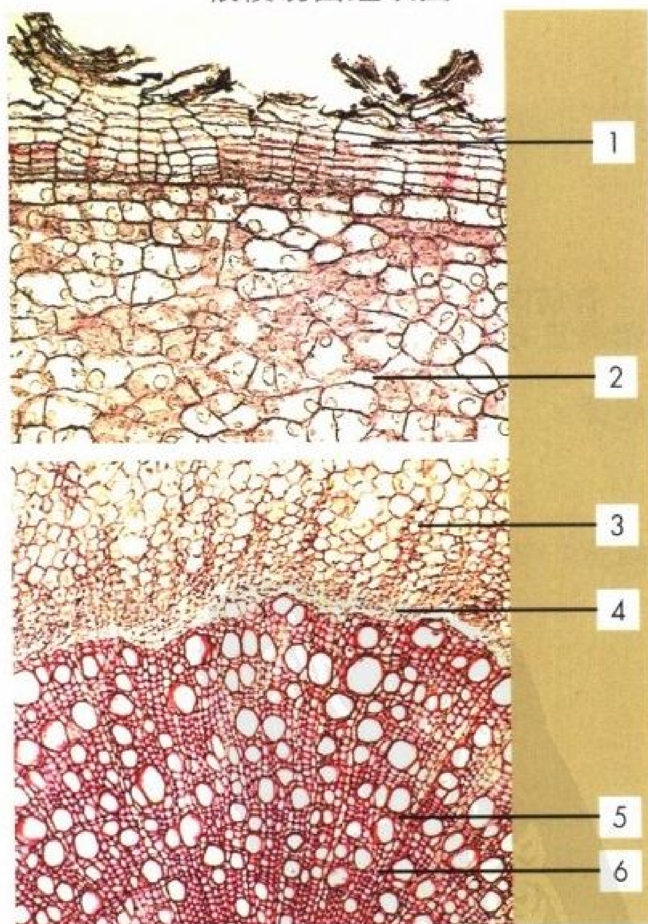
远 志 Yuanzhi

The dried root of *Polygala tenuifolia* Willd. (Fam. Polygalaceae).
远志科植物远志的干燥根。

Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



50μm

Transverse section of root

1. Cork	More than 10 rows of cells.
2. Cortex	Consisting of over 20 rows of parenchymatous cells; with tangential clefts. Parenchymatous cells mostly containing fatty oil droplets; some containing clusters and prisms of calcium oxalate.
3. Phloem	Relatively broad; usually showing radial clefts.
4. Cambium	In a ring.
5. Xylem	Developed; all lignified; rays 1~3 rows of cells in width.
6. Ray	1~3 lays of cells wide.

根横切面组织图注

1. 木栓层	细胞10余列。
2. 皮层	为20余列薄壁细胞，有切向裂隙。薄壁细胞大多含脂肪油滴；有的含草酸钙簇晶及方晶。
3. 韧皮部	较宽广，常现径向裂隙。
4. 形成层	成环。
5. 木质部	发达，均木化，射线宽1~3列细胞。
6. 射线	1~3列细胞。

Main Powder Characteristics
主要粉末显微特征









100μm

Notes

1. Cork cells	Pale yellow or nearly colorless; subpolygonal or long polygonal on the surface view; with pits interrupted arranged.
2. Clusters of calcium oxalate	In parenchymatous cells or scattered; angles relatively broad and thin; apical ends mostly relatively straight. Brightly yellow under a polarizing microscope.
3. Parenchymatous cells	Subrounded or polygonal; containing fatty oil droplets.
4. Fatty oil droplets	Abundant rounded or subrounded; scattered or distributing in parenchymatous cells.

图注

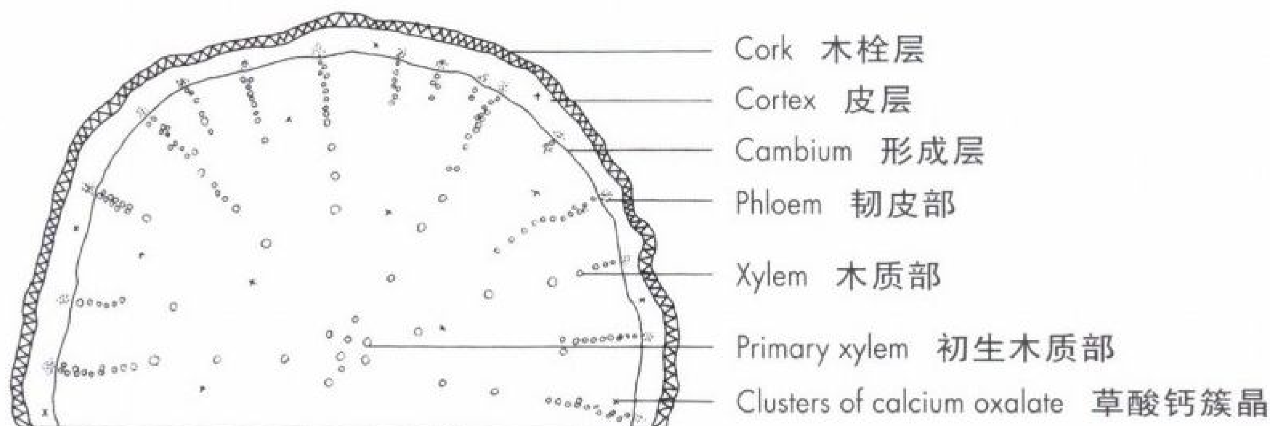
1. 木栓细胞	淡黄色或近无色。表面观类多角形或长多角形，有纹孔呈断续状。
2. 草酸钙簇晶	存在于薄壁细胞中或散在，棱角较宽而薄，先端大多较平截。偏光显微镜下呈亮黄色。
3. 薄壁细胞	类圆形或多角形，含脂肪油滴。
4. 脂肪油滴	较多圆形或类圆形。散在或分布于薄壁细胞中。

太子参 Taizishen

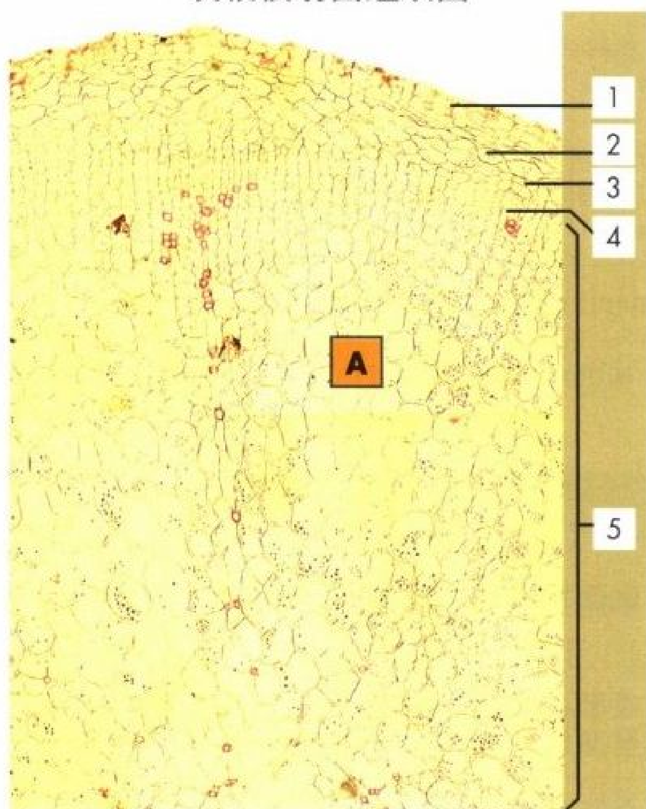


The dried root tuber of *Pseudostellaria heterophylla* (Miq.)Pax ex Pax et Hoffm. (Fam. Caryophyllaceae).
石竹科植物孩儿参的干燥块根。

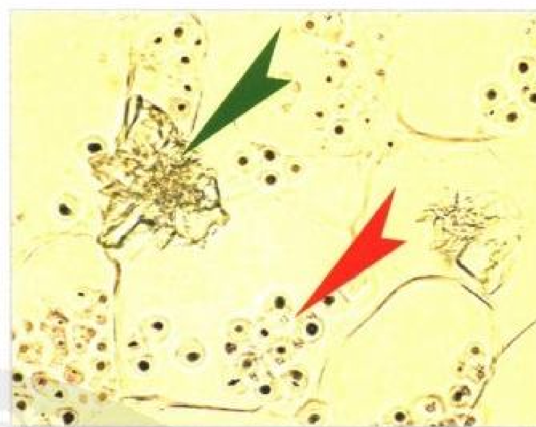
Sketch of transverse section of root tuber 块根横切面简图



Transverse section of root tuber 块根横切面组织图



A Parenchymatous cells containing starch granules " " and clusters of calcium oxalate " " 薄壁细胞含有淀粉粒" "和草酸钙簇晶" "



Transverse section of root tuber

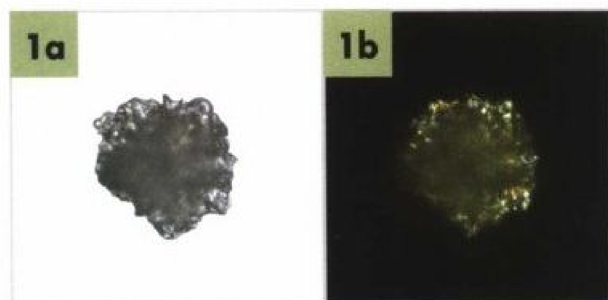
1. Cork	Consisting of 2~4 rows of subsquare and suberized cells.
2. Cortex	Thin, only several rows of parenchymatous cells tangentially elongated.
3. Phloem	Narrow, rays broad.
4. Cambium	Forming a ring.
5. Xylem	Occupying the majority of root, vessels arranged sparsely radially, primary xylem triarch or tetrarch.
Parenchymatous cells	Containing starch granules and clusters of calcium oxalate.

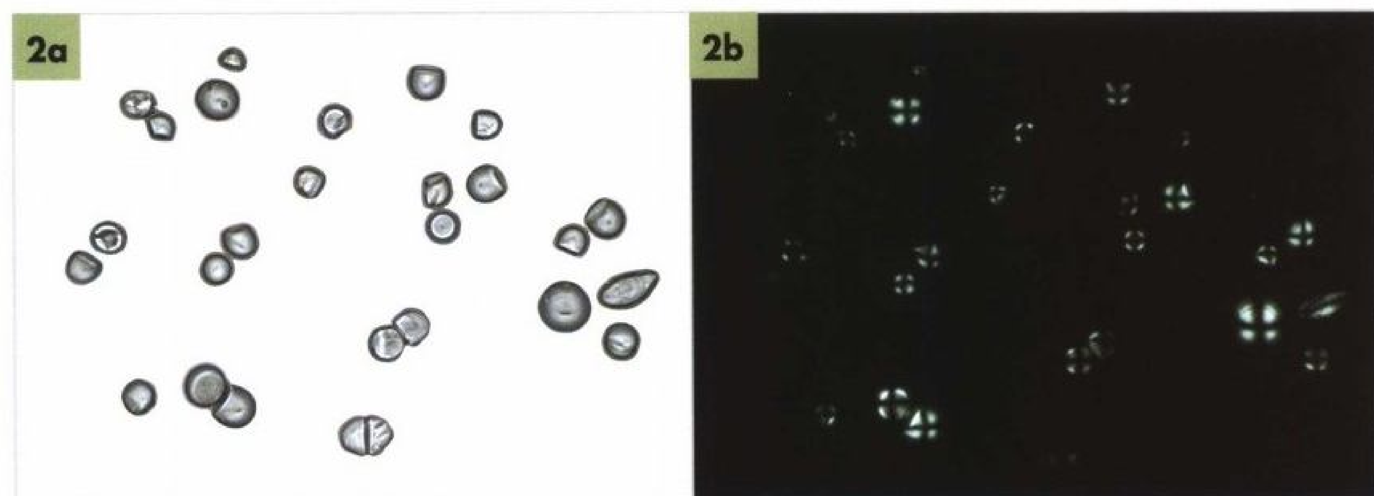
块根横切面组织图注

1. 木栓层	为2~4列类方形木栓细胞。
2. 皮层	薄，仅数列薄壁细胞，切向延长。
3. 韧皮部	窄，射线宽广。
4. 形成层	成环。
5. 木质部	占根的大部分，导管稀疏排列成放射状，初生木质部3~4原型。
薄壁细胞	含淀粉粒和草酸钙簇晶。



Main Powder Characteristics
主要粉末显微特征





100μm

Notes

1. Clusters of calcium oxalate	12~60μm in diameter.
2. Starch granules	Numerous, mostly simple granules, subrounded, 4~24μm in diameter, hilum asteroid, Y-shaped or cleft-shaped etc. Small granules with unclear hilum, compound granules composed of 2~3 components. Black cruciate shape observed under a polarizing microscope.

图注

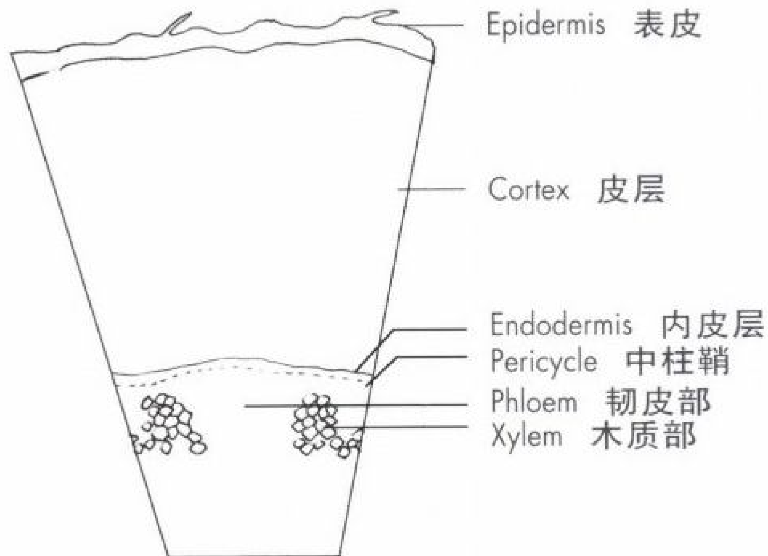
1. 草酸钙簇晶	直径12~60μm。
2. 淀粉粒	极多，多为单粒，类圆形，直径4~24μm，脐点星状、三叉状及裂隙状等，小粒的脐点不明显；复粒由2~3分粒组成。偏光显微镜下可见黑十字现象。

猫爪草 Maozhaocao

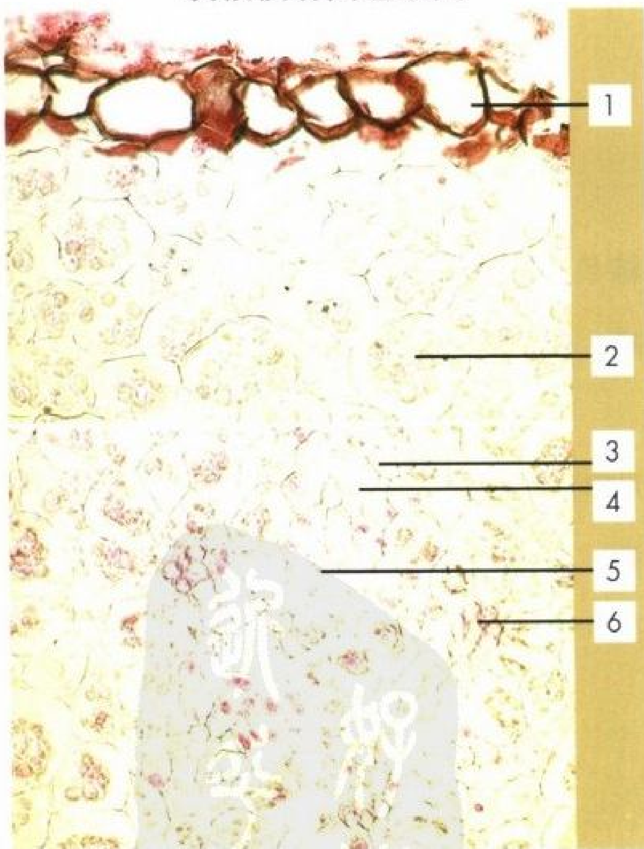


The dried root tuber of *Ranunculus ternatus* Thunb. (Fam. Ranunculaceae).
毛茛科植物小毛茛的干燥块根。

Sketch of transverse section of root tuber
块根横切面简图



Transverse section of root tuber
块根横切面组织图





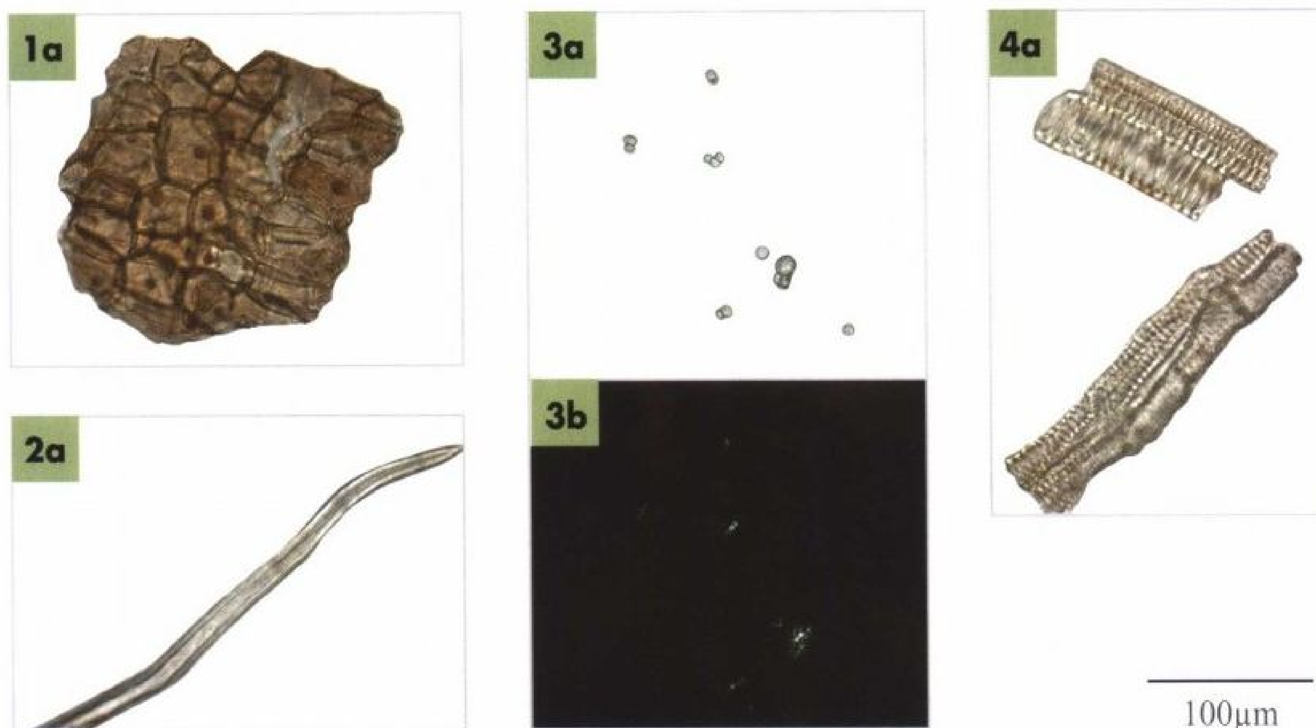
Transverse section of root tuber

1. Epidermis	Cells tangentially elongated, yellowish-brown; some differentiated into epidermal hairs, slightly lignified.
2. Cortex	Consisting of 20~30 rows of cells, and slightly thick walls, with pits.
3. Endodermis	Distinct.
4. Stele	Small, pericycle consisting of 1~2 rows of parenchymatous cells.
5. Phloem	Arranged alternatively with xylem strands.
6. Xylem	Arranged alternatively with phloem strands.
Parenchymatous cells	Filled with starch granules.

块根横切面组织图注

1. 表皮	细胞切向延长，黄棕色，有的分化为表皮毛，微木化。
2. 皮层	为20~30列细胞组成，壁稍厚，有纹孔。
3. 内皮层	明显。
4. 中柱	小，中柱鞘为1~2列薄壁细胞。
5. 韧皮部	与木质部束间隔排列。
6. 木质部	与韧皮部束间隔排列。
薄壁细胞	充满淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermis cells	Brown-yellow or brown; subsquare, subpolygonal or irregular in shape on the surface view; walls relatively thick, cells containing subrounded or elliptical nucleus-like masses.
2. Epidermal hairs	Slender, curved, unicellular; walls relatively thick and lumina clear.
3. Starch granules	Abundant, simple or compound. Simple granules subrounded, subtriangular or irregular in shape; hilum unclear. Black, cruciate shape observed indistinctly under a polarizing microscope.
4. Vessels	Mainly scalariform vessels.

图注

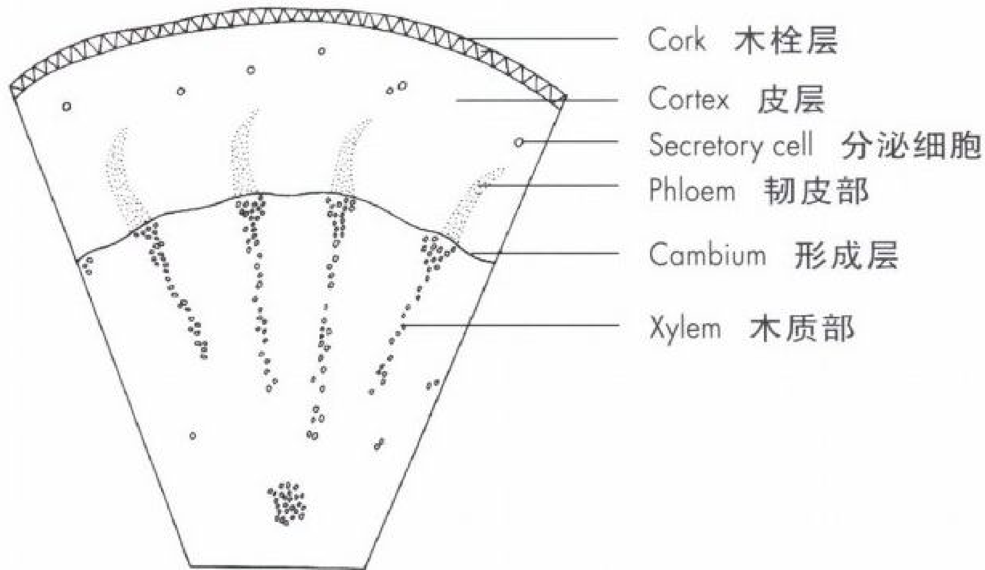
1. 表皮细胞	棕黄色或棕色，表面观类方形、多角形或不规则形，壁较厚，细胞内有类圆形或椭圆形核状物。
2. 表皮毛	细长，弯曲，单细胞，壁较厚，胞腔明显。
3. 淀粉粒	甚多，单粒或复粒。单粒类圆形、类三角形或不规则形，脐点不明显。偏光下黑十字不明显。
4. 导管	多为梯纹导管。



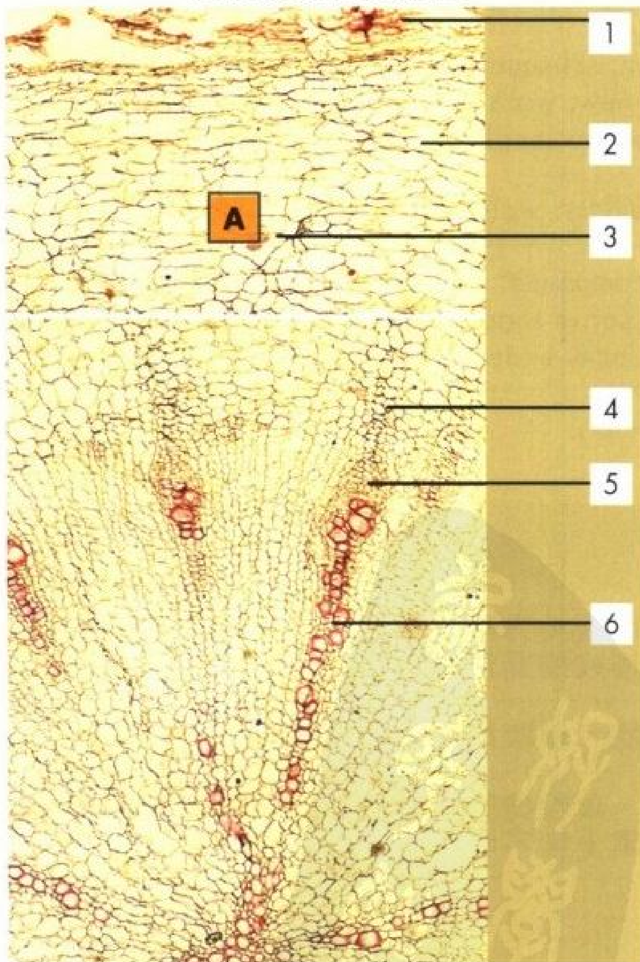
地黄 Dihuang

The dried root tuber of *Rehmannia glutinosa* Libosch. (Fam. Scrophulariaceae)
玄参科植物地黄的干燥块根。

Sketch of transverse section of root tuber
块根横切面简图

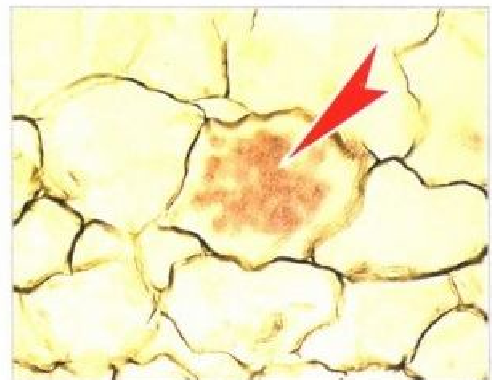


Transverse section of root tuber
块根横切面组织图



100μm

A Secretory cells
分泌细胞



50μm

Transverse section of root tuber

1. Cork	Several rows of cells.
2. Cortex	Parenchymatous cells loosely arranged, scattered with secretory cells.
3. Secretory cells	Cells containing brown subrounded nucleus-like contents.
4. Phloem	Relatively wide, secretory cells relatively rare.
5. Cambium	In a ring.
6. Xylem	Rays broad; vessels sparse and arranged radially.

块根横切面组织图注

1. 木栓层	数列细胞。
2. 皮层	薄壁细胞排列疏松，有分泌细胞散在。
3. 分泌细胞	细胞内含有棕色类圆形核状物。
4. 韧皮部	较宽，分泌细胞较少。
5. 形成层	成环。
6. 木质部	射线宽广，导管稀疏，排列成放射状。



Main Powder Characteristics
主要粉末显微特征







100μm

Notes

1. Parenchymatous cells	Pale grayish-brown, subrounded or irregular shaped; lumina containing subrounded nucleiform contents.
2. Secretory cells	Shape similar to common parenchymatous cells, containing orange oil droplets or oily masses.
3. Vessels	Mainly bordered pitted and reticulate vessels; vessel elements relatively short, up to 92μm in diameter; bordered pits fairly dense.

图注

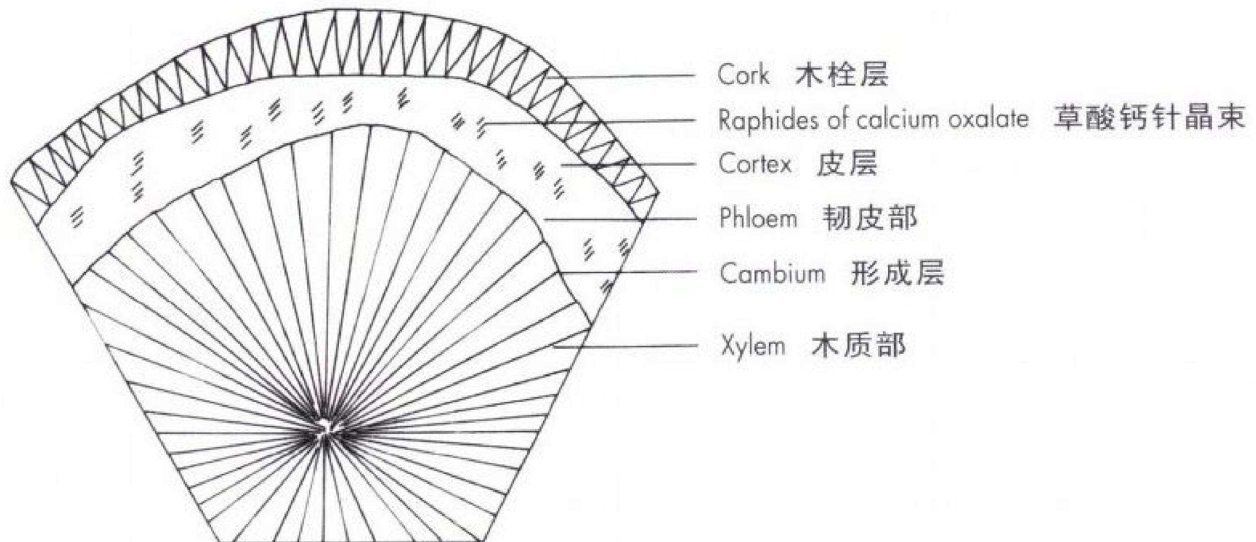
1. 薄壁细胞	淡灰棕色，类圆形或形状不规则，内含有类圆形核状物。
2. 分泌细胞	形状与一般薄壁细胞相似，含有橙黄色油滴或油状物。
3. 导管	主为具缘纹孔及网纹导管，导管分子较短，直径可至92μm，具缘纹孔较密。



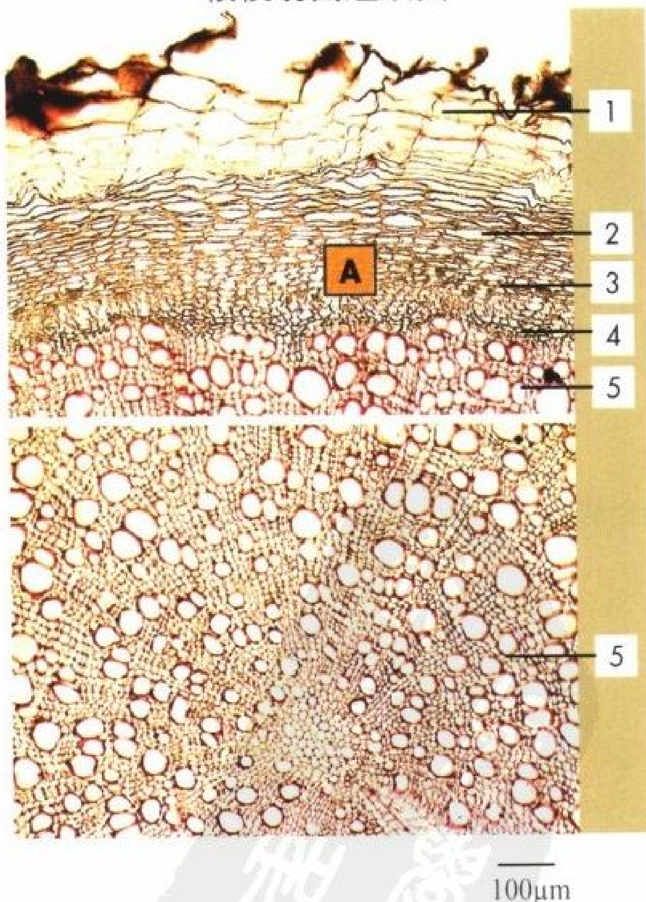
茜草 Qiancao

The dried root of *Rubia cordifolia* L. (Fam. Rubiaceae).
茜草科植物茜草的干燥根。

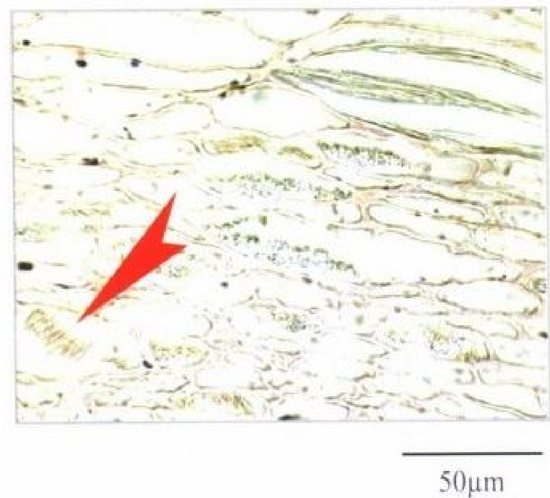
Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



A *Parenchymatous cells containing raphides of calcium oxalate*
薄壁细胞含有草酸钙针晶束



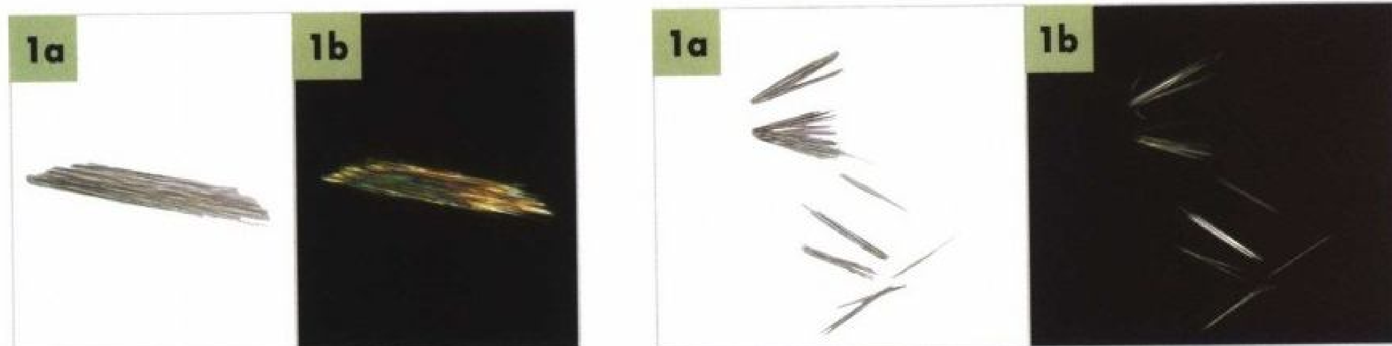
Transverse section of root

1. Cork	6~12 rows of cells, containing brown contents.
2. Cortex	4~5 rows of cells.
3. Phloem	Cells relatively small.
4. Cambium	Indistinct.
5. Xylem	Occupied the majority of root, completely lignified, rays indistinct.
Parenchymatous cells	Containing raphides of calcium oxalate.

根横切面组织图注

1. 木栓层	细胞6~12列，含棕色物。
2. 皮层	4~5列细胞。
3. 韧皮部	细胞较小。
4. 形成层	不甚明显。
5. 木质部	占根的主要部分，全部木化，射线不明显。
薄壁细胞	含草酸钙针晶束。

Main Powder Characteristics
主要粉末显微特征





100μm

Notes

1. Raphides of calcium oxalate	Scattered or in bundles, consisting in the parenchyma, raphides 20~75μm long; showing bright yellowish-white with polychrome under a polarizing microscope.
2. Vessels	Scattered singly or aggregated in bundles, mostly bordered pitted vessels.
3. Tracheids	Numerous, mostly in bundles, walls slightly thick and pits clear.
4. Cork cells	Polygonal or irregular, walls thick, containing brown contents.

图注

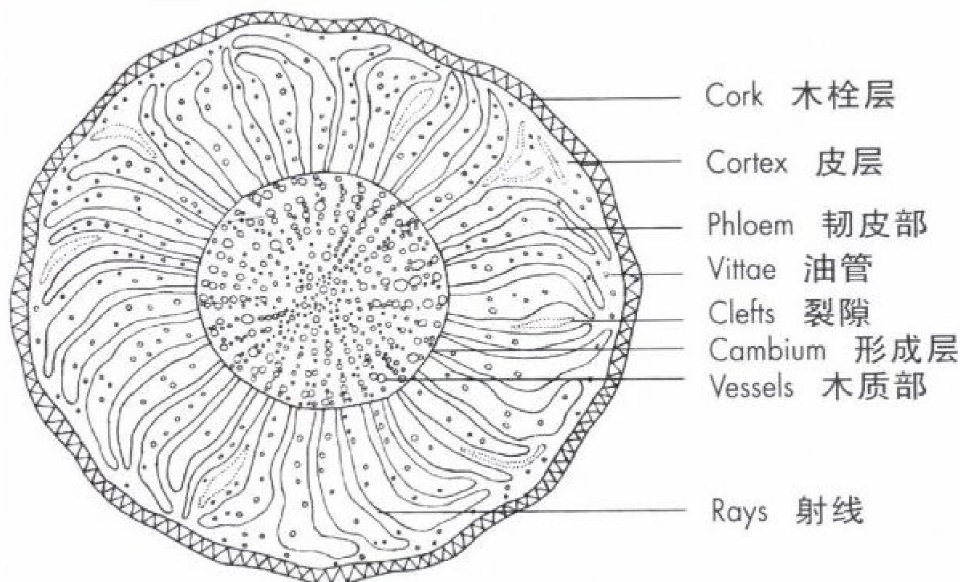
1. 草酸钙针晶束	散在或成束存在于薄壁组织中，针晶长20~75μm。偏光下呈亮黄白间多彩色。
2. 导管	单个散在或相聚成群，多为具缘纹孔导管。
3. 管胞	众多。多成束存在，壁略厚，纹孔明显。
4. 木栓细胞	多角形或不规则形，壁厚，内含棕色物。



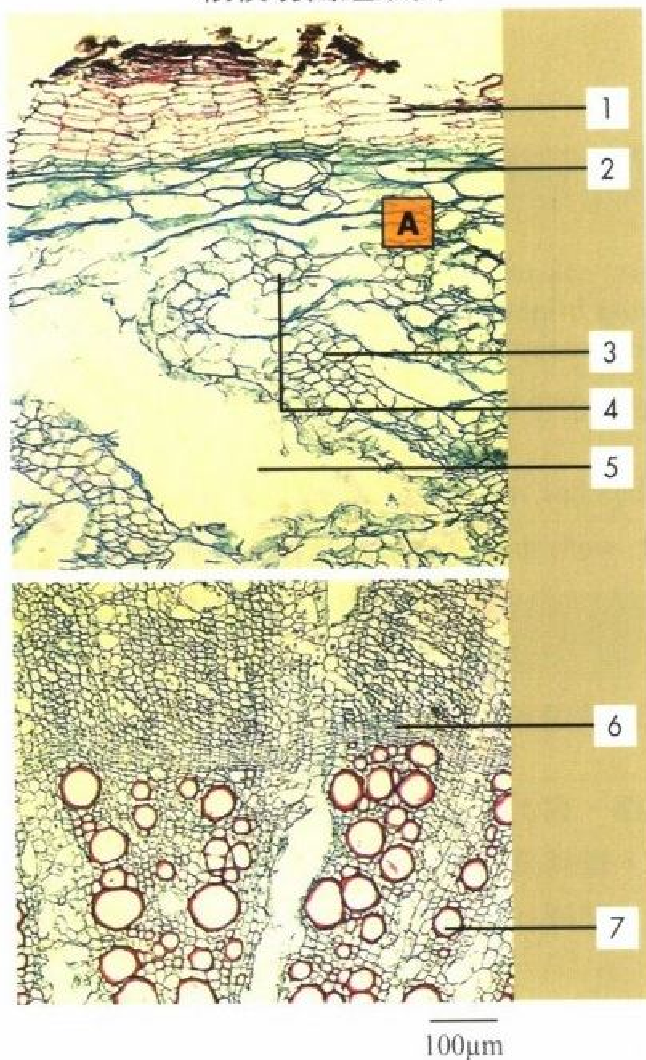
防风 Fangfeng

The dried root of *Saposhnikovia divaricata* (Turcz.) Schischk. (Fam. Umbelliferae)
伞形科植物防风的干燥根。

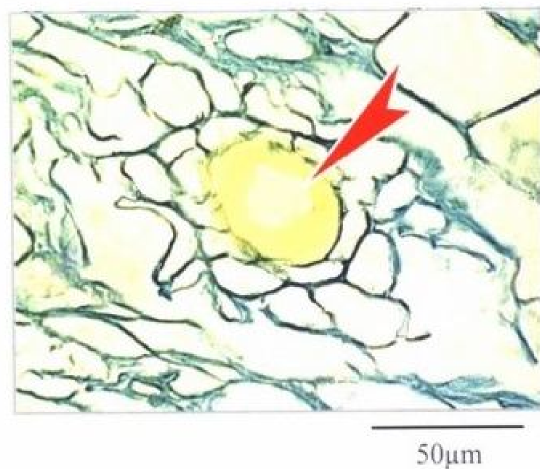
Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



A Vittae
油管





Transverse section of root

1. Cork	Consisting of 5~30 rows of cells.
2. Cortex	Narrow, with relatively large elliptical vittae.
3. Phloem	Relatively broad, scattered with numerous subrounded vittae; rays mostly curved and usually becoming cleft in the outer part.
4. Vittae	Subrounded, surrounded by 4~8 secretory cells, gold-yellow secretion visible in vittae.
5. Clefts	Easily observed.
6. Cambium	Distinct, in the form of a ring.
7. Xylem	Vessels abundant, arranged radially.

根横切面组织图注

1. 木栓层	为5～30列细胞。
2. 皮层	窄，有较大的椭圆形油管。
3. 韧皮部	较宽，有多数类圆形油管；射线多弯曲，外侧常成裂隙。
4. 油管	类圆形，周围分泌细胞4～8个，管内可见金黄色分泌物。
5. 裂隙	易见。
6. 形成层	明显，呈环状。
7. 木质部	导管甚多，呈放射状排列。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Vittae	Filled with gold-yellow strip-shaped secretion, wide or slender, some left from vittae.
2. Fibres	Mostly in bundles, pale yellow, slender; with extremely thickened walls, pits scarce and lumina narrow.
3. Vessels	Reticulate or bordered pitted vessels.
4. Stone cells	Rare, yellowish-green, longrounded or rectangular, with relatively thickened walls.

图注

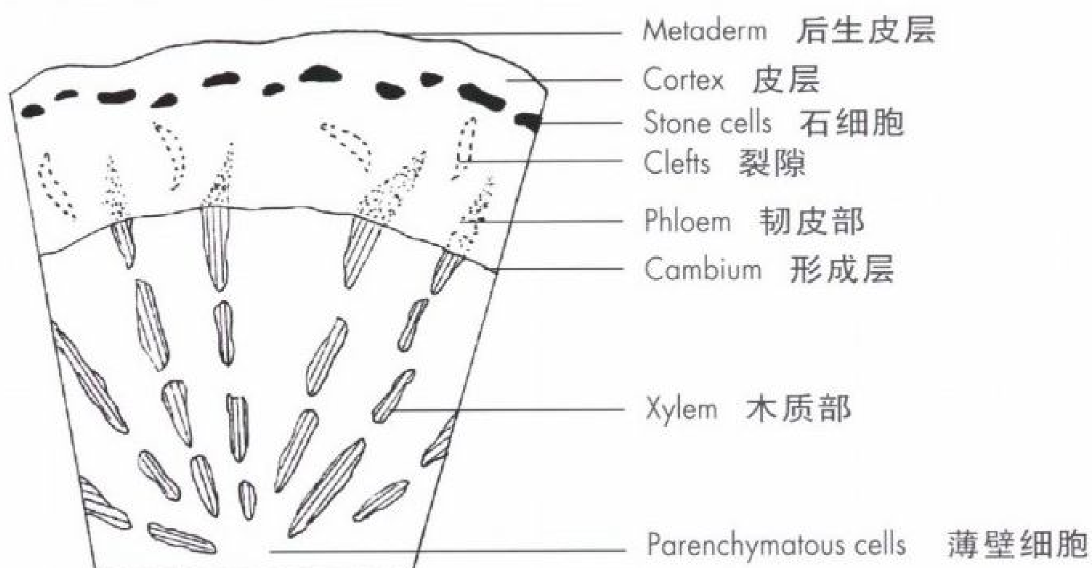
1. 油管	充满金黄色条状分泌物，粗细不一，有的由油管中溢出。
2. 纤维	多成束，淡黄色，细长，壁极厚，孔沟稀少，胞腔狭窄。
3. 导管	网纹或具缘纹孔。
4. 石细胞	少见，黄绿色，长圆形或长方形，壁较厚。



玄参 Xuanshen

The dried root of *Scrophularia ningpoensis* Hemsl. (Fam. Scrophulariaceae).
玄参科植物玄参的干燥根。

Sketch of transverse section of root
根横切面简图





Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells	Numerous, mostly singly scattered or 2~3 in groups; some connected with brownish-yellow metaderm cells; pale brown, yellowish-brown or colorless. Rectangular, subsquare, subrounded, triangular or fusiform in shape; pits fine and small, pit canals mostly ramified, lumina relatively large.
2. Xylem fibres	Slender, slightly curved; with blunt or obliquely pointed endings; some with short branches; pits fine, oblique or intersecting to form V-shape or crisscross-shape.
3. Metaderm cells	Brownish-yellow. Subrectangular on the surface view; walls slightly thickened and suberized, some undulantly curved.

图注

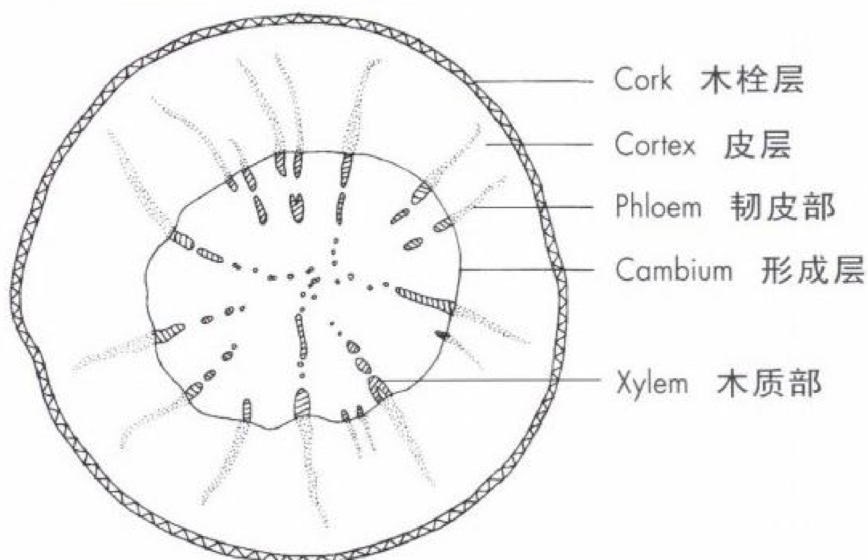
1. 石细胞	较多，多单个散在或2~3成群，有时与棕黄色后生皮层细胞连结，淡棕色、黄棕色或无色。呈长方形、类方形、类圆形、三角形或梭形，纹孔细小，孔沟多分叉，胞腔一般较大。
2. 木纤维	细长，稍弯曲，末端钝圆或斜尖，有的具短分枝，有细小斜纹孔或纹孔交叉成人字形、十字形。
3. 后生皮层细胞	棕黄色。表面观细胞呈类长方形，壁稍增厚，木栓化，有的微波状弯曲。

天葵子 Tiankuizi

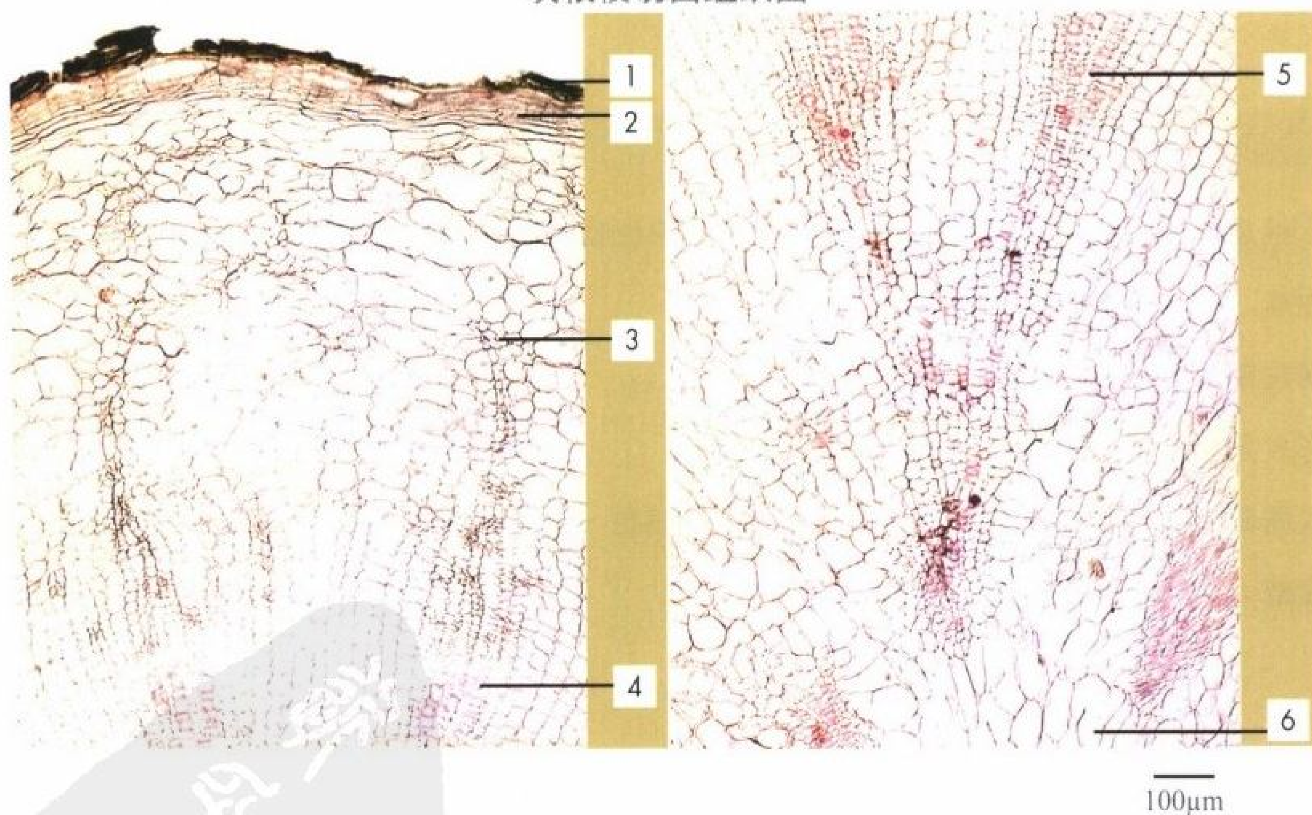


The dried root tuber of *Semiaquilegia adoxoides* (DC.)Makino (Fam. Ranunculaceae).
毛茛科植物天葵的干燥块根。

Sketch of transverse section of root tuber
块根横切面简图



Transverse section of root tuber
块根横切面组织图



100μm

Transverse section of root tuber

1. Cork	Many rows of cells containing brown contents.
2. Cortex	Relatively narrow.
3. Phloem	Broad.
4. Cambium	In a ring.
5. Xylem	Rays over 20 rows of cells in width; vessels arranged radially.
6. Pith	Relatively small.

块根横切面组织图注

1. 木栓层	为多列细胞，含棕色物。
2. 皮层	较窄。
3. 韧皮部	宽广。
4. 形成层	成环。
5. 木质部	射线宽至20余列细胞，导管放射状排列。
6. 髓部	较细小。





Notes

1. Cork cells	Yellowish-brown or reddish-brown; usually more than 10 rows of cells overlapped. In the lateral view (1a-1): cells flat and arranged regularly; on the surface view (1a-2): subsquare or irregular shape; with thick walls.
2. Vessels	Mainly scalariform and spiral vessels; pits relatively narrow and fine.

图注

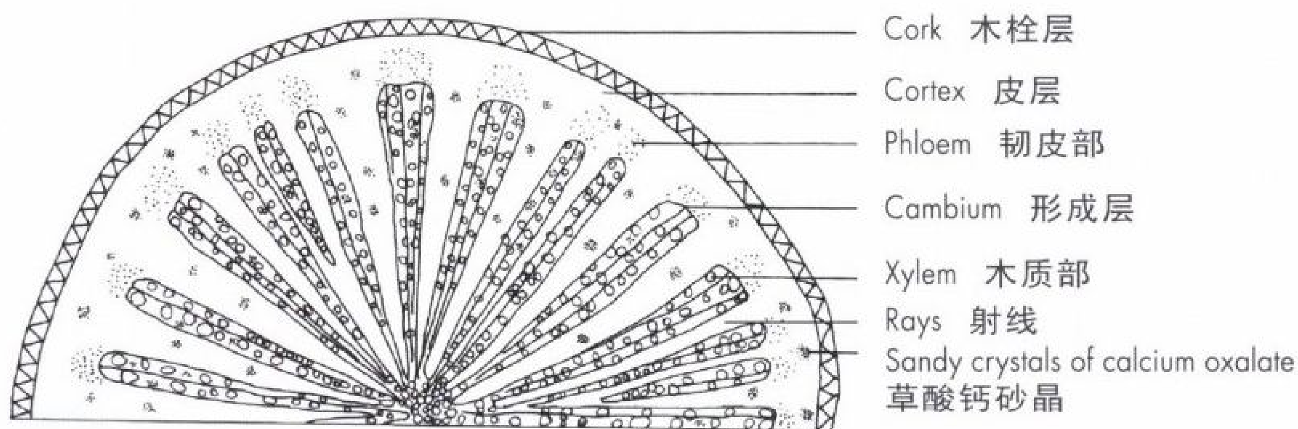
1. 木栓细胞	黄棕色或红棕色，常十余层重叠。侧面观(1a-1)：细胞扁平，排列整齐；表面观(1a-2)：呈类方形或不规则形，壁较厚。
2. 导管	主为梯纹及螺纹导管，纹孔较狭细。



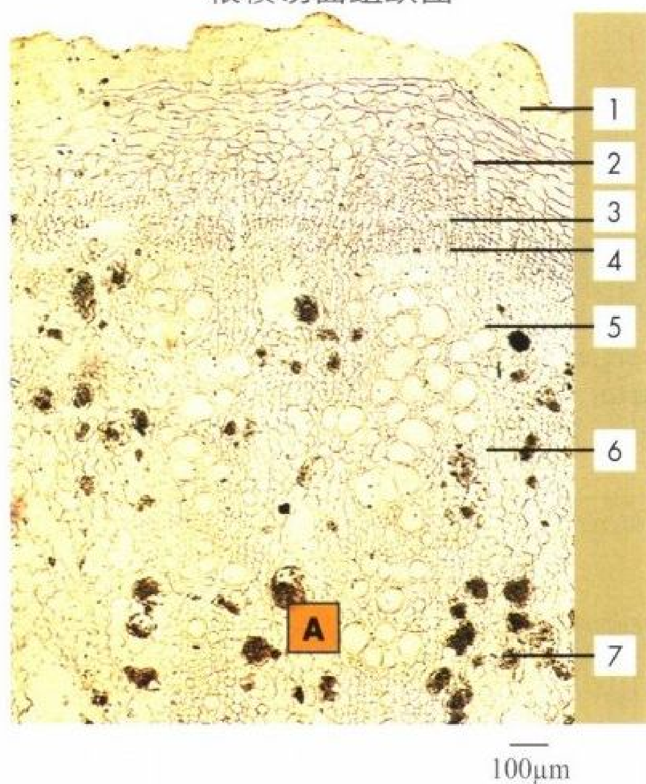
银柴胡 Yinchaihu

The dried root of *Stellaria dichotoma* L. var. *lanceolata* Bge. (Fam. Caryophyllaceae).
石竹科植物银柴胡的干燥根。

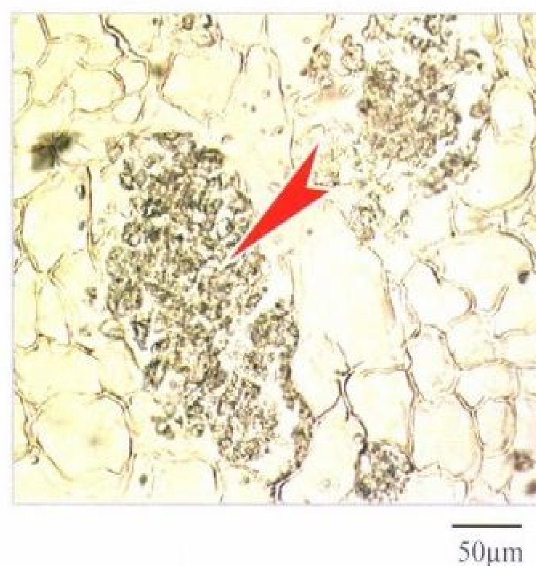
Sketch of transverse section of root 根横切面简图



Transverse section of root 根横切面组织图



A *Sandy crystals of calcium oxalate* 草酸钙砂晶



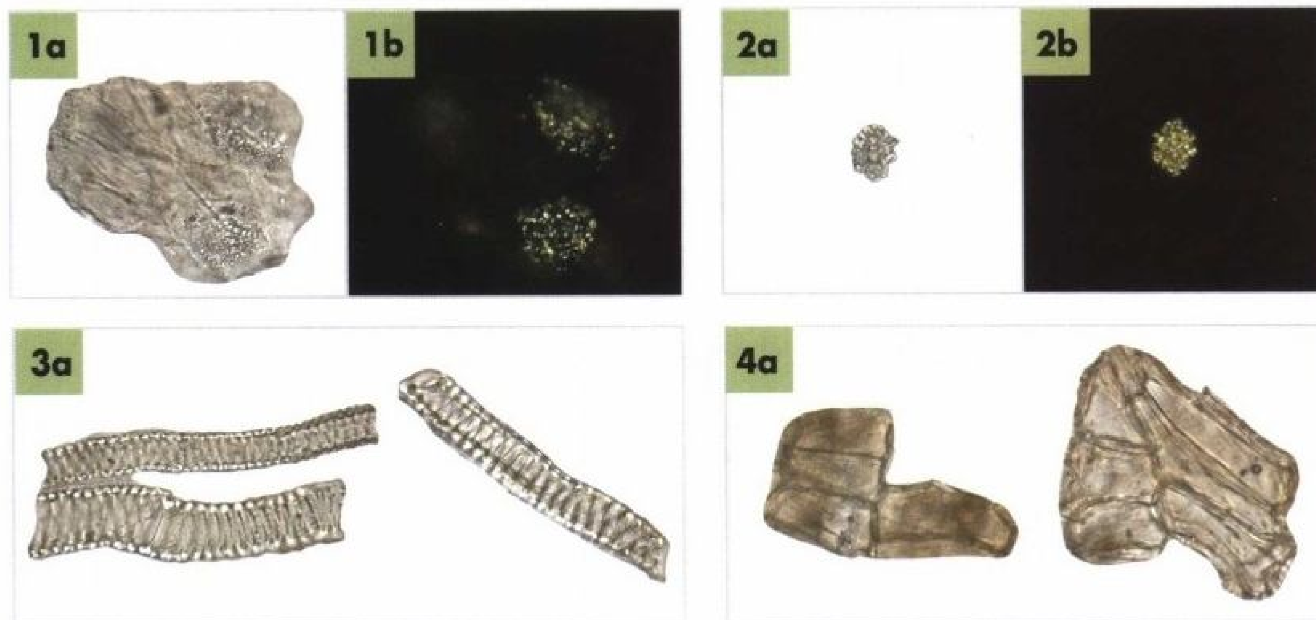
Transverse section of root

1. Cork	Consisting of several to more than 10 rows of cells, yellowish-brown.
2. Cortex	Relatively narrow.
3. Phloem	Sieve tube groups distinct.
4. Cambium	Interfascicular cambium indistinct, intradascicular cambium distinct; arranged interruptedly in a ring.
5. Xylem	Developed.
6. Rays	More than 10 rows of cells wide.
7. Sandy crystals of calcium oxalate	Consisitng in parenchymatous cells, mainly in ray cells.

根横切面组织图注

1. 木栓层	细胞数列至10余列，黄棕色。
2. 皮层	较窄。
3. 韧皮部	筛管群明显。
4. 形成层	束间形成层不明显，束中形成层明显，排列成断续的环。
5. 木质部	发达。
6. 射线	宽至10余列细胞。
7. 草酸钙砂晶	存在于薄壁细胞中，在射线细胞中多见。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Sandy crystals of calcium oxalate	Very abundant, dispersed or densely congested in parenchymatous cells; triangular, arrowhead-shaped, subsquare or irregular in shape, diameter 2~7μm. Yellowish-white in color observed under a polarizing microscope.
2. Clusters of calcium oxalate	Abundant; dispersed or occurred with sandy crystals in the same parenchyma cells, size various, angles fine and numerous, easily separated. Orange separated by polychrome in color observed under a polarizing microscope.
3. Vessels	Mainly bordered pitted and reticulate vessels, pale yellow or yellow; bordered pitted vessels thick and large, easily broken and their pits elliptical or elongated in rows or parallel, some pit apertures connected transversely. Reticulate vessels relatively slender, with large pits and perforations on the lateral walls.
4. Cork cells	Pale yellow; rectangular in the cross section; polygonal on the surface view, the walls slightly lignified and thin, somewhat sinuous.

图注

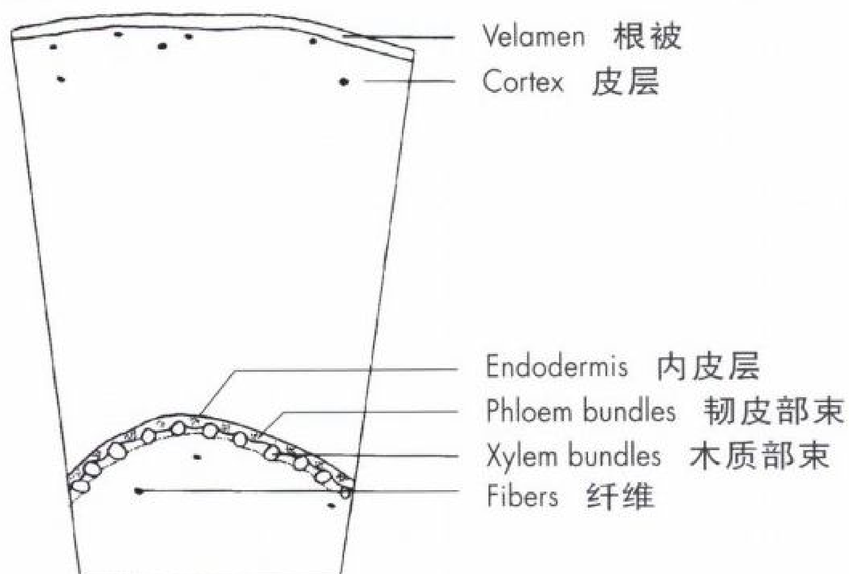
1. 草酸钙砂晶	极多，散在或密集充塞于薄壁细胞中。呈三角形、箭头形、类方形或不规则形，直径2~7μm。偏光显微镜下呈黄白色。
2. 草酸钙簇晶	较多，散在，或与砂晶存在于同一薄壁细胞中。大小不一，棱角较小而多，易散离。偏光显微镜下呈橙黄间多彩色。
3. 导管	主为具缘纹孔和网纹导管，淡黄色或黄色。具缘纹孔导管粗大，易破碎，具缘纹孔椭圆形或横长延长，并列或互列，有的纹孔口横向连接。网纹导管较细，纹孔大，侧壁具穿孔。
4. 木栓细胞	淡黄色。横断面观略呈长方形；表面观类多角形，壁薄，微木化，稍波状弯曲。

百部 Baibu

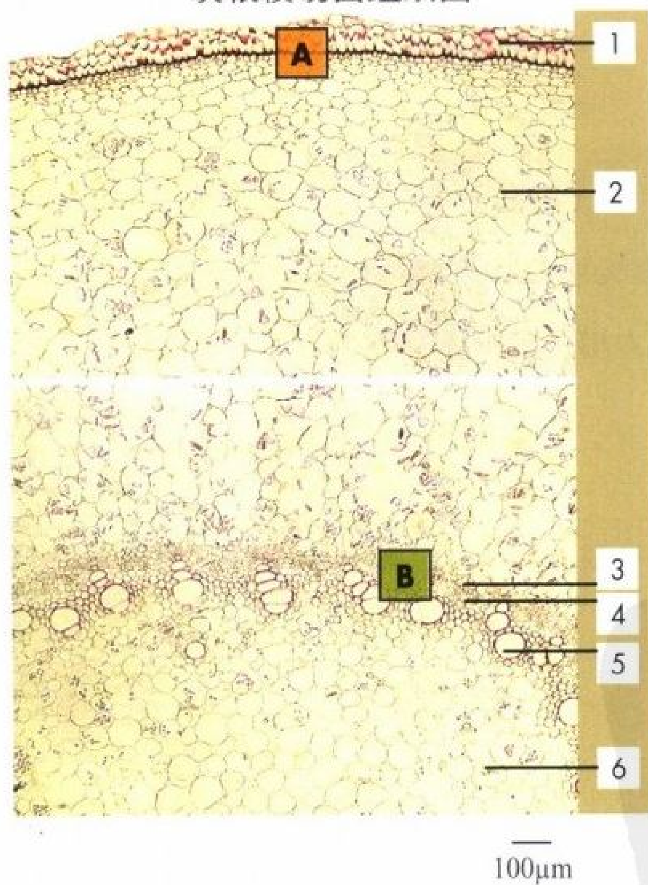


The dried root tuber of *Stemona tuberosa* Lour. (Fam. Stemonaceae).
百部科植物对叶百部的干燥块根。

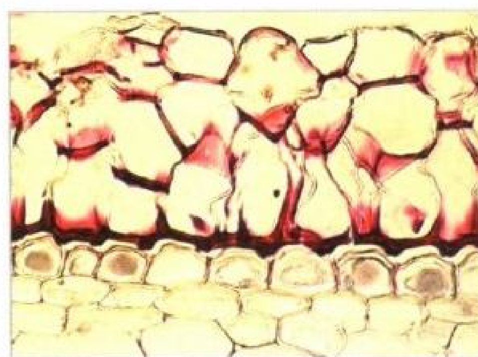
Sketch of transverse section of root tuber
块根横切面简图



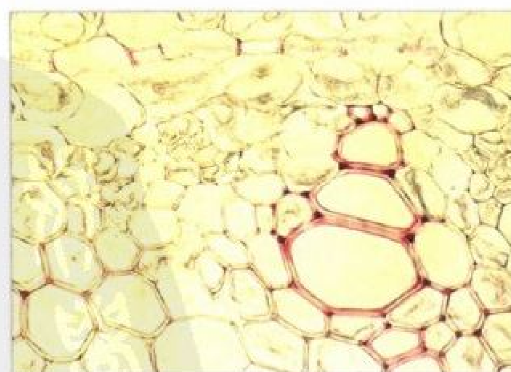
Transverse section of root tuber
块根横切面组织图



A Velamen 根被



B Phloem bundles and xylem bundles 韧皮部束与木质部束



Transverse section of root tuber

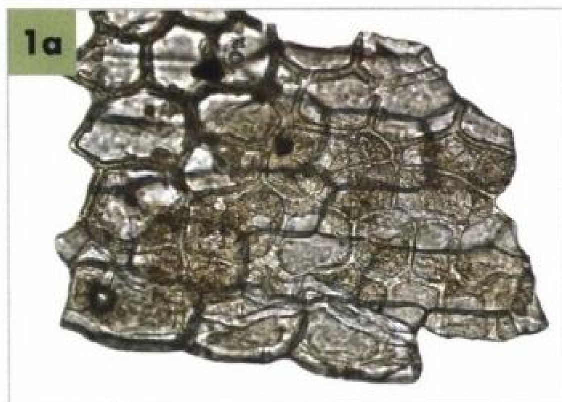
1. Velamen	Consisting of 3 rows of cells; walls without fine striations, the inner walls of the inner layers heavily thickened.
2. Cortex	Fibres scattered in the outer part of cortex, subsquare, with slightly lignified walls.
3. Endodermis	Distinct.
4. Phloem bundles	36~40.
5. Xylem bundles	Vessels rounded-polygonal, up to 107μm in diameter; the inner side of xylem bundles linked up with xylem fibres and slightly lignified parenchymatous cells into a ring.
6. Pith	With few fibres, usually scattered singly.

块根横切面组织图注

1. 根被	为3列细胞，细胞壁无细条纹，其内层细胞的内壁特厚。
2. 皮层	外侧散有纤维，类方形，壁微木化。
3. 内皮层	明显。
4. 韧皮部束	36～40个。
5. 木质部束	导管圆多角形，直径至107μm，其内侧与木纤维及微木化的薄壁细胞连接成环层。
6. 髓部	纤维少，常单个散在。



Main Powder Characteristics
主要粉末显微特征







100μm

Notes

1. Velamen cells	Pale yellowish-brown or colorless. Rectangular or long polygonal on the surface view; walls slightly thickened, suberized and lignifed; cells with densely interlaced fine strations, hilum-like striations ususlly occurred at the corners of cells. Anticlinal walls of epidermal cells of root, undulantly curved, without fine striations.
2. Cortex fibres	Numerous, mostly singly scattered in parenchyma, ususlly closed to velamen cells. Slender, slightly curved, with on side projecting dentelatedly, non-lignified, pits and pit canals unclear.
3. Xylem fibres	Relatively long, walls slightly thickened and lignified, with simple pits or bordered pits; pit apertures crossed or V-shaped.

图注

1. 根被细胞	淡黄棕色或无色。表面观呈长方形或长多角形，壁稍厚，木栓化及木化，整个细胞均有致密交织的细条纹，近细胞角隅处常有脐样纹理。根的表皮细胞垂周壁作波状弯曲，无细条纹。
2. 皮层纤维	较多，大多单个散列于薄壁组织中，常邻近根被细胞。细长，稍弯曲，一边略呈齿状突出，非木化，纹孔及孔沟不明显。
3. 木纤维	较长，壁稍厚，木化，具单斜纹孔或具缘纹孔，纹孔口相交成人字形或十字形。

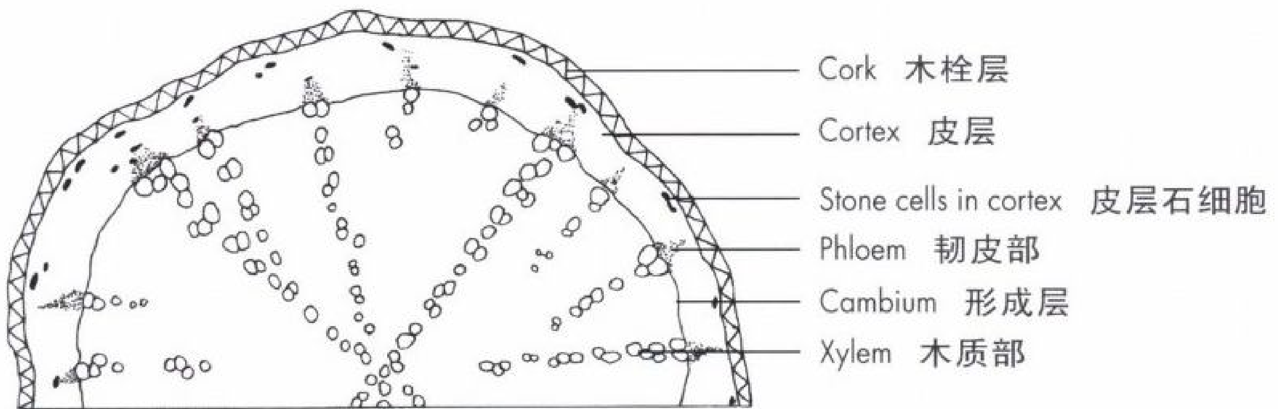
Radix Stephaniae Tetrandrae



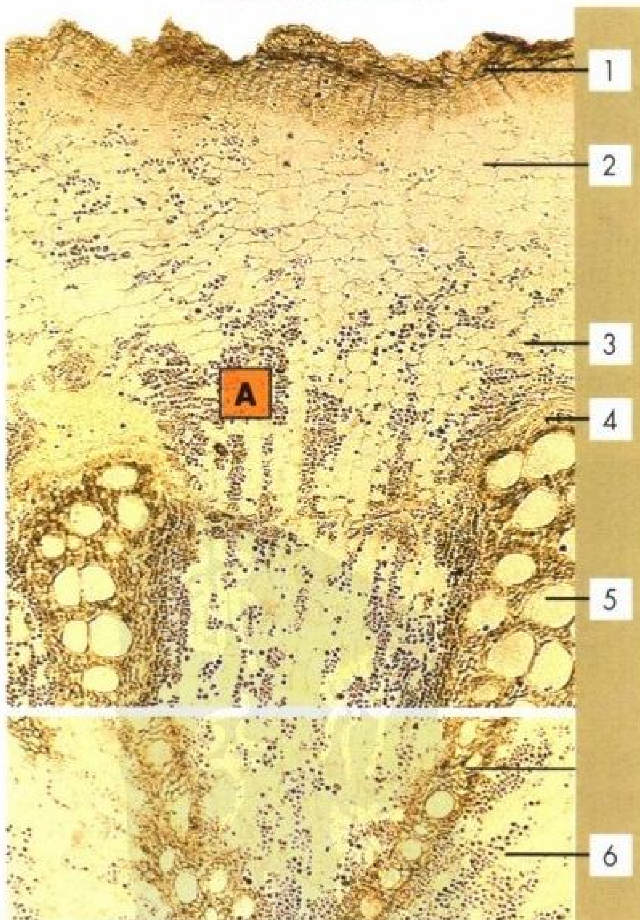
防己 Fangji

The dried root of *Stephania tetrandra* S. Moore. (Fam. Menispermaceae).
防己科植物粉防己的干燥根。

Sketch of transverse section of root
根横切面简图

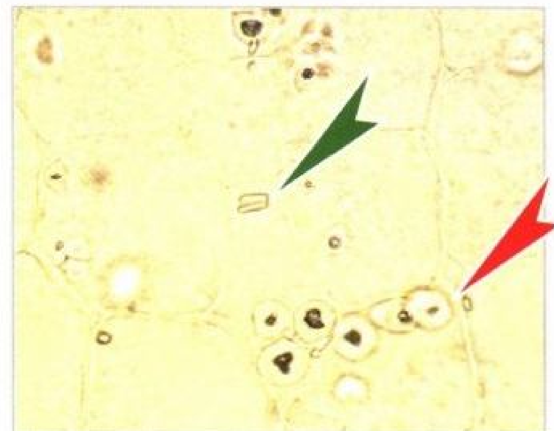


Transverse section of root
根横切面组织图



100μm

A **Parenchymatous cells filled with starch granules " " and fine rod-shaped crystals " "**
薄壁细胞充满淀粉粒" "，并可见细小杆状草酸钙结晶" "。


50μm

Transverse section of root

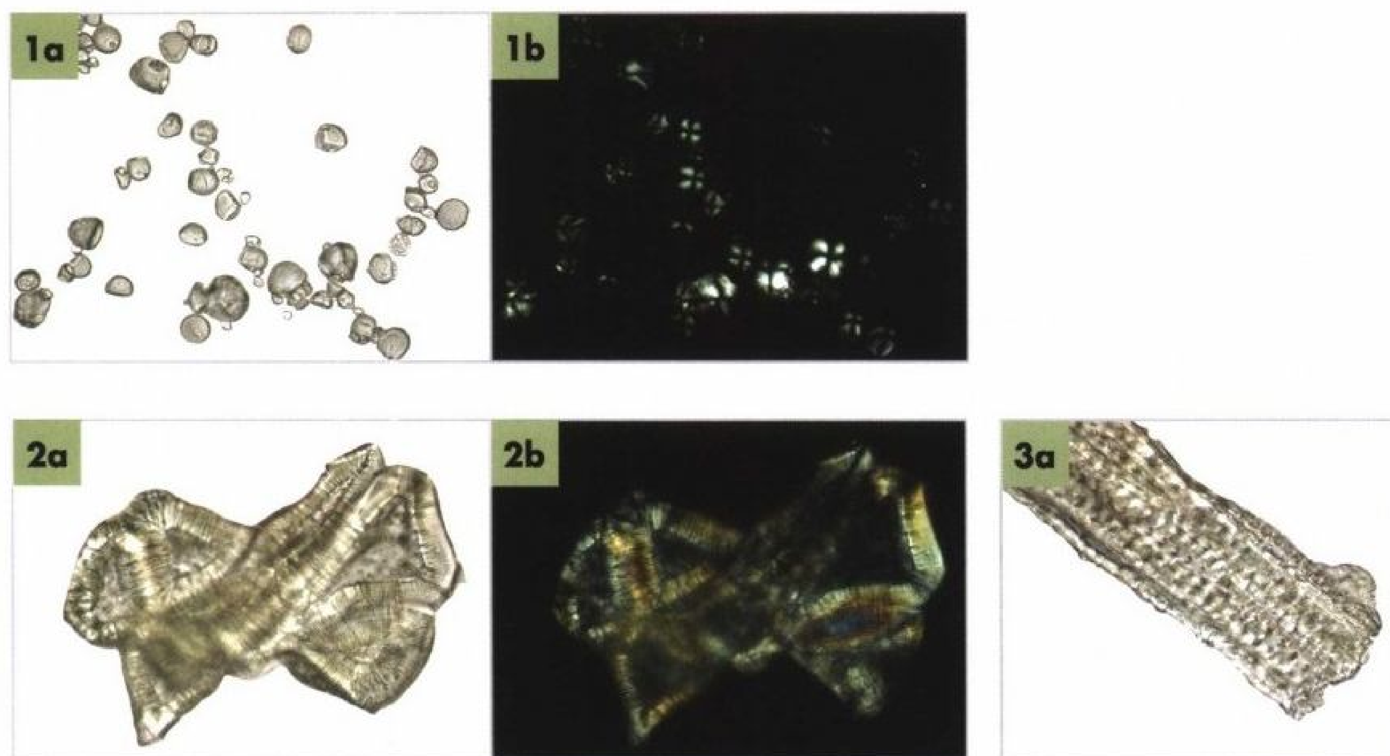
1. Cork	Sometimes remained.
2. Cortex	Scattered with stone cells groups; usually arranged tagentially.
3. Phloem	Relatively broad.
4. Cambium	In a ring.
5. Xylem	Occuping a majority of root; rays relatively broad; vessels rare; arranged radially.
6. Parenchymatous cells	Filled with starch granules; and fine rod-shaped crystals of calcium oxalate visible.

根横切面组织图注

1. 木栓层	有时残存。
2. 皮层	有石细胞群，常切向排列。
3. 韧皮部	较宽。
4. 形成层	成环。
5. 木质部	占大部，射线较宽，导管稀少，呈放射状排列。
6. 薄壁细胞	充满淀粉粒，并可见细小杆状草酸钙结晶。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Abundant. Simple granules globular, helmet-shaped or polygonal. Hilum dotted, slit-shaped, V-shaped or stellate; striation indistinct. Compound granules composed of 2~4 components, showing distinct black cruciate shape under a polarizing microscope.
2. Stone cells	Nunerous; elliptical, subrounded or irregular; wall thick and pit canals obvious; showing bright yellowish-white with polychrome color under a polarizing microscope.
3. Xylem fibres	Wall slightly thin and lignified.

图注

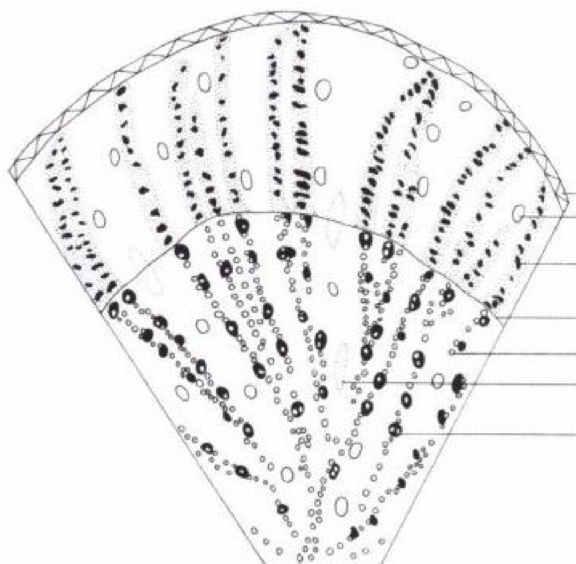
1. 淀粉粒	众多，单粒呈球形，盔帽形或多角形。脐点点状、裂缝状、"人"字状或星状，层纹不清。复粒多由2~4个单粒组成。偏光下呈明显黑十字。
2. 石细胞	较多。呈椭圆形、类圆形或不规则形，壁厚，孔沟明显。偏光下呈亮黄白间多彩色。
3. 木纤维	壁稍薄，木化。

川木香 Chuanmuxiang

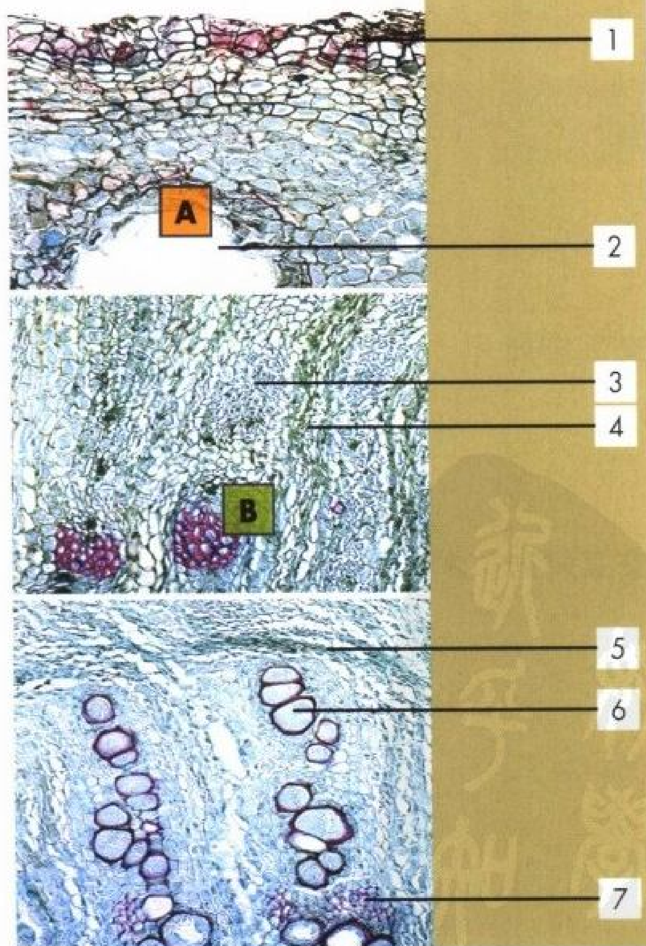


The dried root of *Vladimiria souliei* (Franch.) Ling (Fam. Compositae).
菊科植物川木香的干燥根。

Sketch of transverse section of root
根横切面简图



Transverse section of root
根横切面组织图



A Oil cavities
油室



B Sieve tube groups " " and fibre bundles " "
筛管群 " " 和纤维束 " "



Transverse section of root

1. Cork	Consisting of several rows of brown cells.
2. Oil cavities	Scattered in parenchyma.
3. Phloem	Sieve tube groups and fibre bundles alternately arranged.
4. Rays	Relatively broad.
5. Cambium	Undulately curved.
6. Xylem	Vessel groups and fibre bundles alternately arranged, lignified.
7. Fibre Bundles	Lignified.

根横切面组织图注

1. 木栓层	为数列棕色细胞。
2. 油室	散在于薄壁组织中。
3. 韧皮部	筛管群与纤维束呈交互排列。
4. 射线	较宽。
5. 形成层	波状弯曲。
6. 木质部	导管群与纤维束呈交互排列，木化。
7. 纤维束	木化。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Inulin	Abundant in absolute alcohol, present in irregular clumps or fan-shaped, colorless; radiate striations present in cold chloral hydrate, but the striations will disappear when placed for a long time.
2. Stone cells	Abundant, fibrous in shape; the walls lignified and thick.
3. Xylem fibres	Abundant, often present in bundles; the single fibre long lanceolate or fusiform with both ends blunt or slightly tapering, oblique at one end sometime; the walls quite thick and lignified with oblate pits.
4. Vessels	Reticulate and scalariform vessels, the walls lignified.

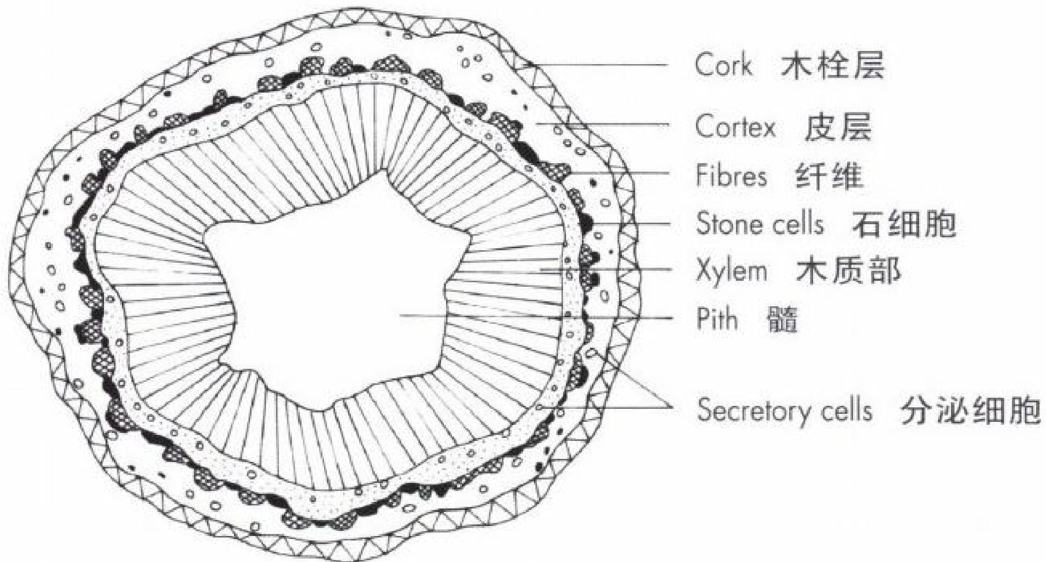
图注

1. 菊糖	无水乙醇装片观察，见有众多菊糖，呈不规则块状或略呈扇形，无色；水合氯醛装片不加热观察，可见放射状纹理，久置则消失。
2. 石细胞	纤维状，较多，壁厚，木化。
3. 木纤维	较多，常成束，单个呈长披针形或长梭形，末端钝圆或微尖，有时一端歪斜，壁较厚，木化，纹孔扁圆形。
4. 导管	为网纹及梯纹，壁木化。

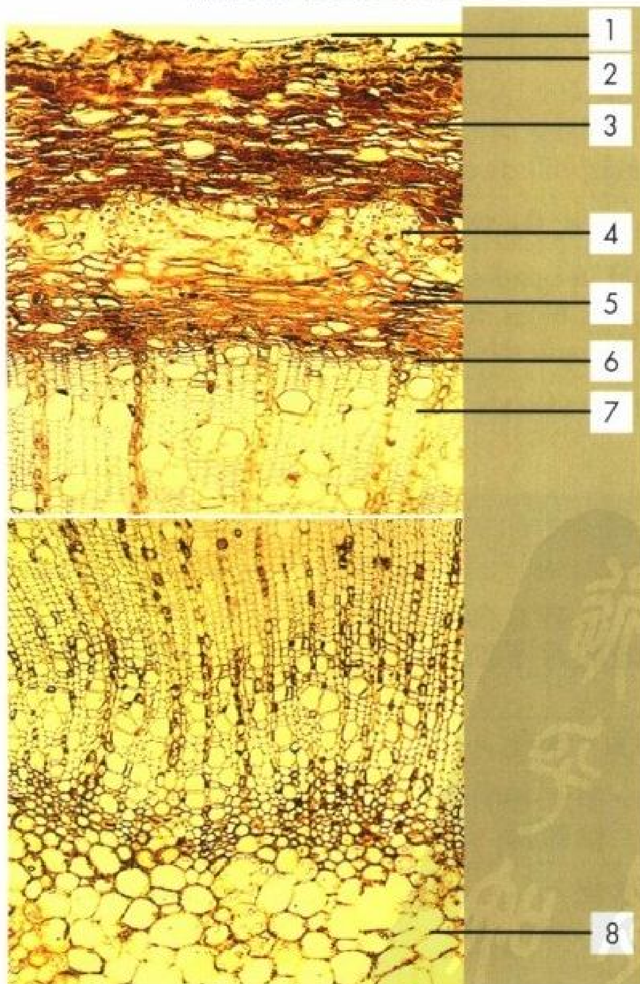


The dried twig of *Cinnamomum cassia* Presl (Fam. Lauraceae).
樟科植物肉桂的干燥嫩枝。

Sketch of transverse section of twig
嫩枝横切面简图



Transverse section of twig
嫩枝横切面组织图



100μm

Transverse section of twig

1. Epidermis	1 row of cells in twig, showing unicellular non-glandular sometimes.
2. Cork	3~5 rows of cells, 1 row of innermost cells with thickened outer walls.
3. Cortex	Scattered with oil cells and stone cells.
4. Stone cells groups in pericycle	Arranged in an interrupted ring, and accompanied by fibre bundles.
5. Phloem	Scattered with secretory cells and fibres.
6. Cambium	Distinct.
7. Xylem	Rays 1~2 rows of cells wide, containing brown contents; vessels singly scattered or 2 to several grouped; xylem fibres with relatively thin walls, not easy to distinguish them from xylem parenchymatous cells.
8. Pith	With slightly thick and lignified walls.
Cells of rays	Containing raphides of calcium oxalate.

嫩枝横切面组织图注

1. 表皮	嫩枝表皮为1列细胞，有时可见单细胞非腺毛。
2. 木栓层	3~5列细胞，最内层1列细胞外壁增厚。
3. 皮层	有油细胞及石细胞散在。
4. 中柱鞘石细胞群	断续排列成环，并伴有纤维束。
5. 韧皮部	有分泌细胞及纤维散在。
6. 形成层	明显。
7. 木质部	射线宽1~2列细胞，含棕色物，导管单个散列或2至数个相聚，木纤维壁较薄，与木薄壁细胞不易区别。
8. 髓部	细胞壁略厚，木化。
射线细胞	含草酸钙针晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells	Abundant, present singly or in groups; colorless, pale yellow or brown in color. Subsquare, subrounded, rectangular, or short fusiform in shape, margins slightly uneven; the walls relatively thick, striations rare, pit canals clear.
2. Phloem fibres	Present in bundles or scattered singly; colorless or brown. Fusiform, slightly curved, with endings sharp, short pointed or obtuse round; margins projected dentelatedly; primary walls clear, the walls quite thick and lignified, pit canals unclear.
3. Oil cells	Often broken; the complete ones subround or elliptical in shape, some containing pale brown oil droplets.

图注

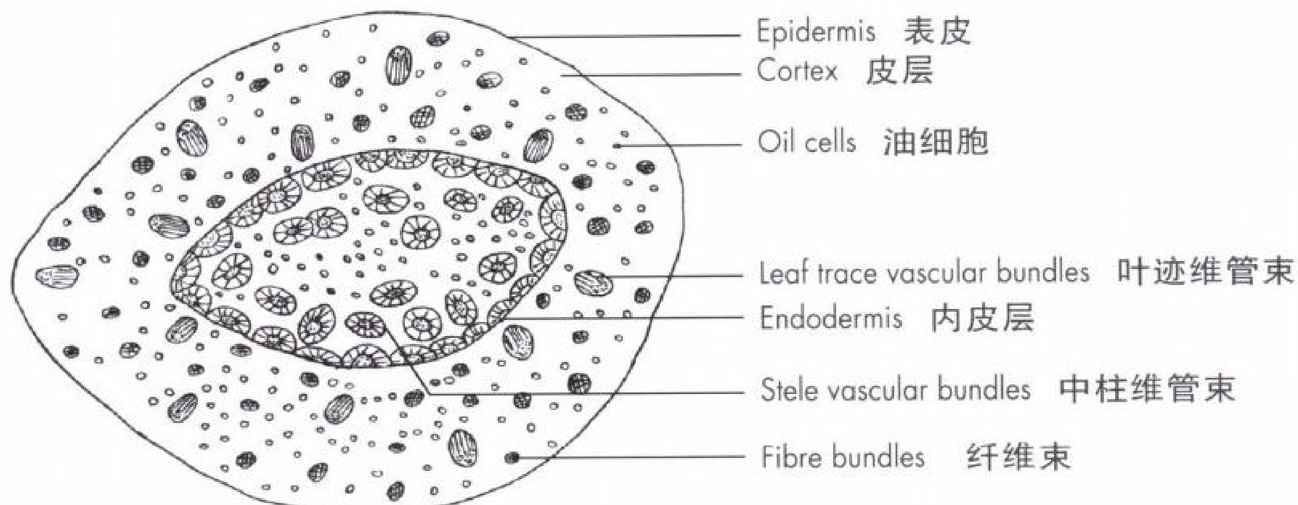
1. 石细胞	较多，单个散在或成群，无色、淡黄色或棕色。呈类方形、类圆形、长方形、短梭形或纺锤形，边缘稍不平整，壁较厚，少数层纹可见，孔沟明显。
2. 韧皮纤维	成束或单个散在，无色或棕色。呈梭形，稍弯曲，末端锐尖、短尖或钝圆，有的边缘齿状突出，初生壁明显，壁甚厚，木化，孔沟不明显。
3. 油细胞	多破碎，完整者类圆形或椭圆形，有的含淡棕色油滴。

石菖蒲 Shichangpu

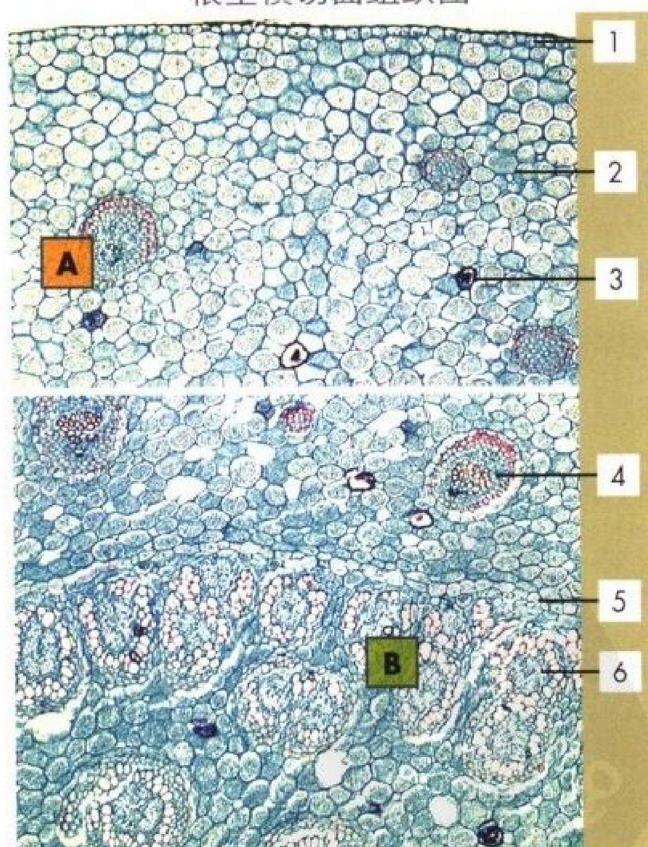


The dried rhizome of *Acorus tatarinowii* Schott (Fam. Araceae).
天南星科植物石菖蒲的干燥根茎。

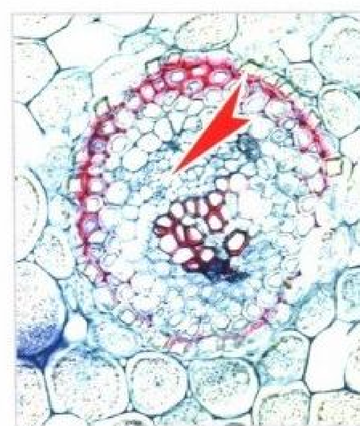
Sketch of transverse section of rhizome
根茎横切面简图



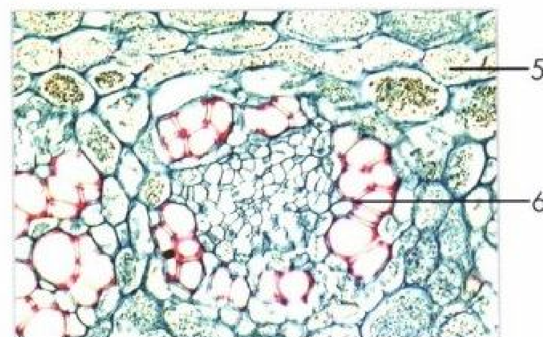
Transverse section of rhizome
根茎横切面组织图



A Leaf-trace vascular bundle
叶迹维管束



B Endodermis and stele vascular bundles
内皮层和中柱维管束



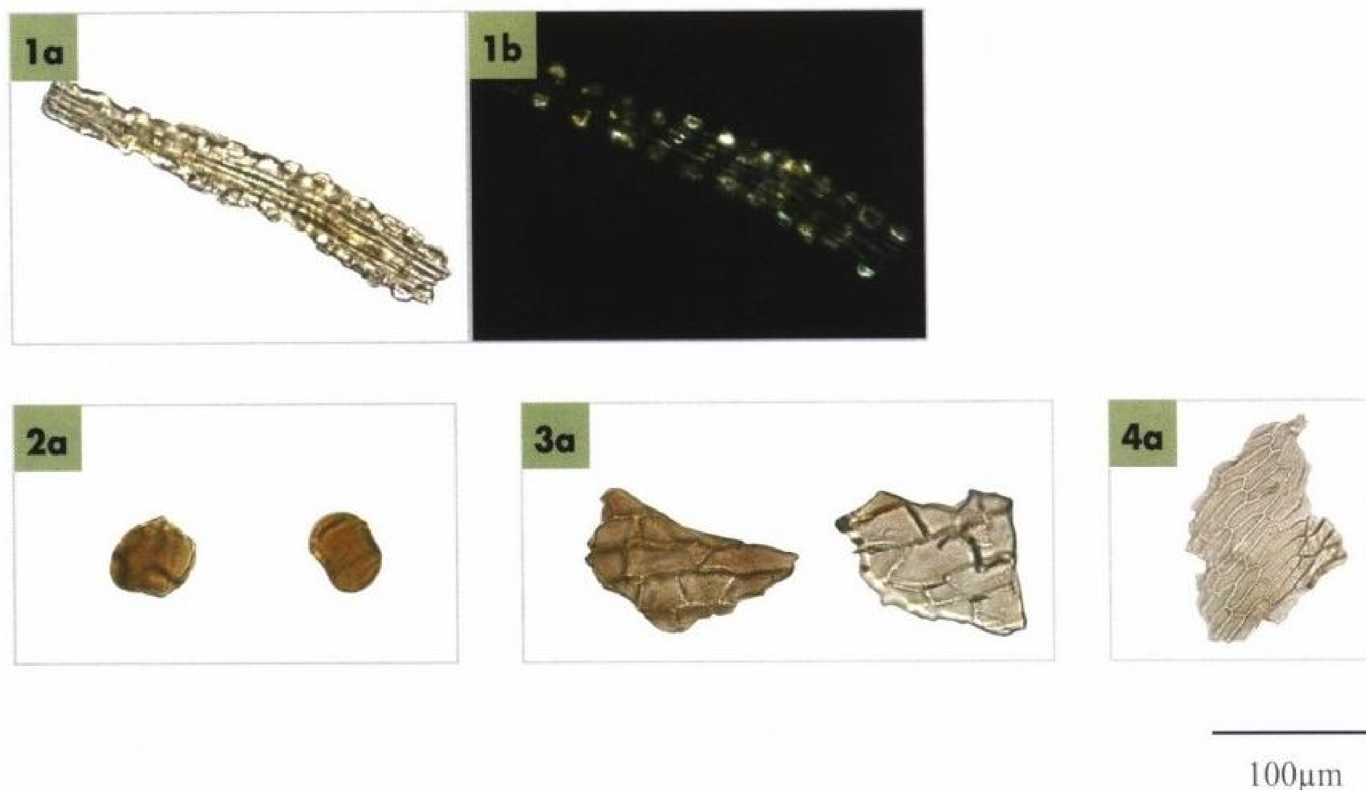
Transverse section of rhizome

1. Epidermis	Cells with thickened outer walls; brown; some containing reddish-brown contents.
2. Cortex	Broad; scattered with fibre bundles and leaf-trace vascular bundles.
3. Oil cells	Scattered in parenchyma.
4. Leaf-trace vascular bundles	Collateral; fibrous bundle sheath in a ring; lignified; surrounded by cells containing prisms of calcium oxalate.
5. Endodermis	Distinct, showing casparian dots.
6. Stele vascular bundles	Amphivasal and collateral vascular bundles; with less fibrous bundle sheath; surrounded by cells containing prisms of calcium oxalate.

根茎横切面组织图注

1. 表皮	细胞外壁增厚，棕色，有的含红棕色物。
2. 皮层	宽广，散有纤维束及叶迹维管束。
3. 油细胞	散在于薄壁组织中。
4. 叶迹维管束	外韧型，维管束鞘纤维成环，木化，周围细胞含草酸钙方晶。
5. 内皮层	明显，可见凯氏点。
6. 中柱维管束	周木型及外韧型，维管束鞘纤维较少，周围细胞含草酸钙方晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibres and crystal fibres	In bundles; few scattered; colorless or pale yellow. Cells around fibre bundles containing prisms of calcium oxalate; forming crystal fibres. Brightly orange color observed under a polarizing microscope.
2. Secretory cells	Abundant; scattered in parenchymatous cells; subrounded or longrounded; lumina filled with orangish-red secretion.
3. Epidermal cells	Pale brown or cherry-red; rectangular, subsquare or subpolygonal on the surface view; outer periclinal walls with cracks.
4. Epidermal cells of scale leaf	Pale brown; subrectangular on the surface view.

图注

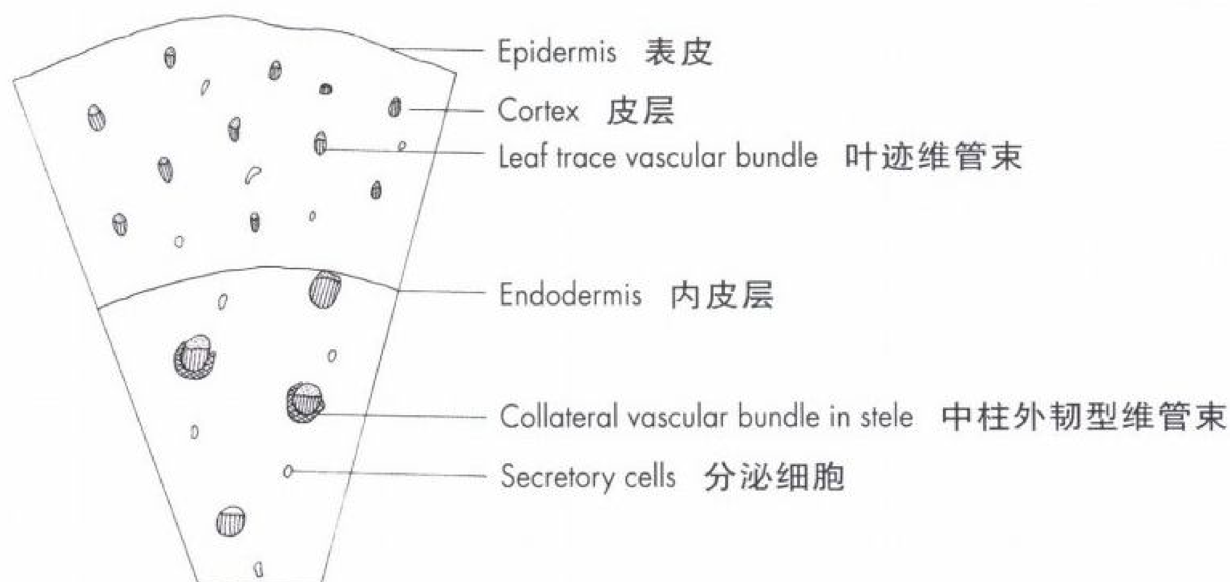
1. 纤维和晶纤维	成束，少数散离，无色或淡黄色。纤维束周围细胞中含有草酸钙方晶，形成晶纤维。偏光显微镜下呈亮橙黄色。
2. 分泌细胞	较多。分布于薄壁细胞中，类圆形或长圆形，胞腔内充满类橙红色分泌物。
3. 表皮细胞	淡棕色或樱红色。表面观呈长方形、类方形或类多角形，外平周壁具裂纹。
4. 鳞叶表皮细胞	淡棕色。表面观呈类长方形。

高良姜 Gaoliangjiang

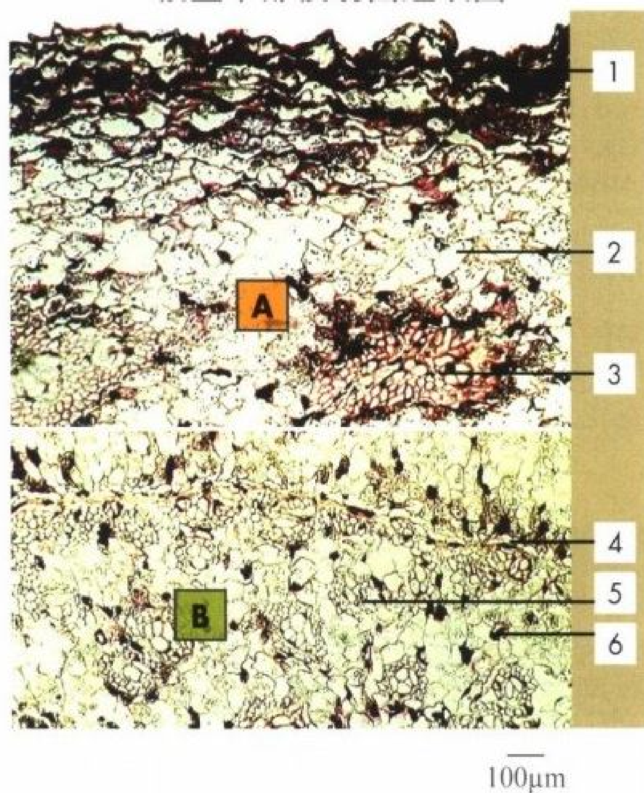


The dried rhizome of *Alpinia officinarum* Hance (Fam. Zingiberaceae).
姜科植物高良姜的干燥根茎。

Sketch of transverse section of rhizome
根茎横切面简图



Transverse section of rhizome
根茎中部横切面组织图



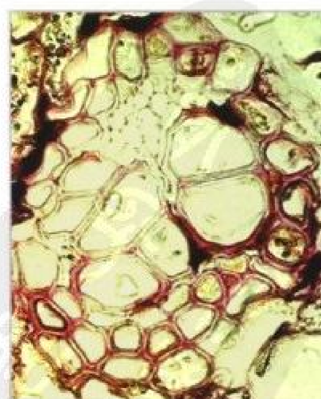
100μm

A *Secretory cells " " and starch grains " "*
分泌细胞" "和淀粉粒" "



50μm

B *Collateral vascular bundle in stele*
中柱外韧型维管束



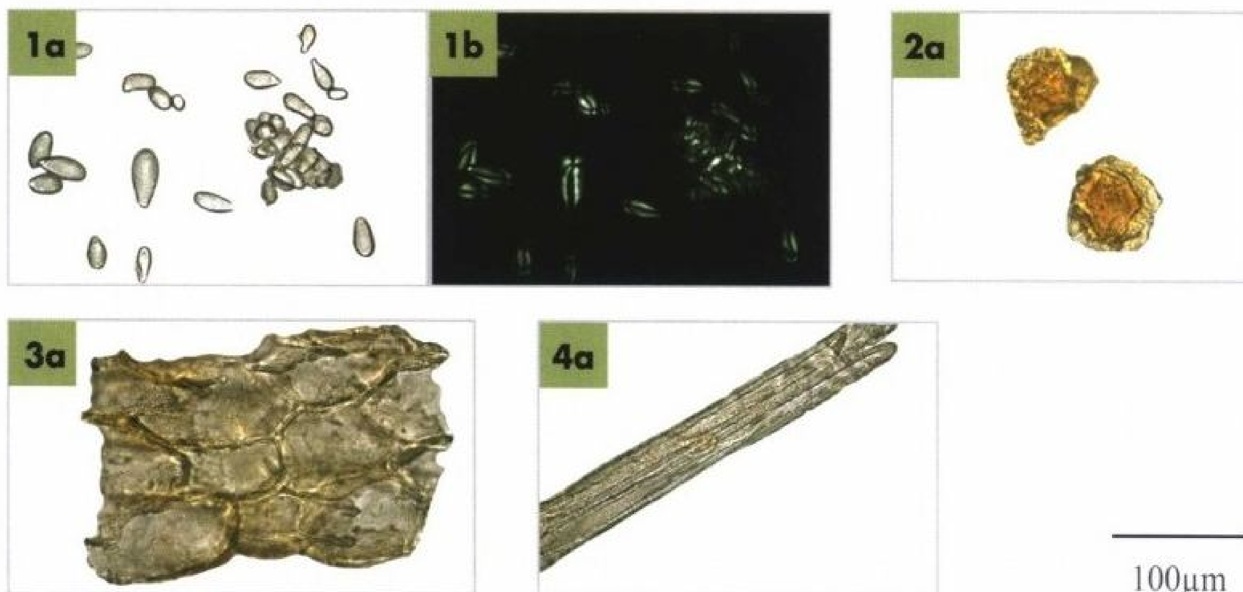
50μm

Transverse section of rhizome

1. Epidermis	Cells with thickened outer walls, some of them containing reddish-brown amorphisms.
2. Cortex	Leaf trace vascular bundles relatively abundant and collateral type.
3. Leaf trace vascular bundles	Scattered.
4. Endodermis	Distinct.
5. Collateral vascular bundle in stele	Abundant, vascular bundle sheath fibres arranged in a ring and ligni fied.
6. Secretory cells	Scattered in parenchyma of cortex and stele, containing yellow or reddish-brown resinous contents.
Parenchymatous cells	Filled with starch granules.

根茎横切面组织图注

1. 表皮	细胞外壁增厚，有的含红棕色非晶形物。
2. 皮层	叶迹维管束较多，外韧型。
3. 叶迹维管束	散在。
4. 内皮层	明显。
5. 中柱外韧型维管束	甚多，束鞘纤维成环，木化。
6. 分泌细胞	分布于皮层及中柱薄壁组织中，内含黄色或红棕色树脂状物。
薄壁细胞	充满淀粉粒。



Notes

1. Starch granules	Abundant; simple granules rod-like, bottle shaped, kidney shaped, long elliptical, rhombic, long ovate or subrounded (small granules), 24~44μm long, 8~27μm in diameter; hilum dotted, short cleft or Y-shaped in shape; striations unclear; compound granules composed of 2~8 components. Black, cruciate shape observed under a polarizing microscope.
2. Secretory cells	Often broken; intact ones subrounded or elliptical, 40~48μm in diameter; the walls somewhat thick; pits present, lumina containing orangish-red or brownish-red resinous secretions.
3. Parenchyma cells	Pale yellowish-brown; subrounded, subpolygonal, fusiform or irregular in shape; 64~80μm in diameter; the walls slightly thick, up to 5μm in thickness; tiny prisms of calcium oxalate occasionally visible, square, fusiform or rectangular in shape.
4. Fibres	Present in bundles or singly; slender, 20~37μm in diameter; the walls slightly thick, the lumina containing reddish-brown contents.

图注

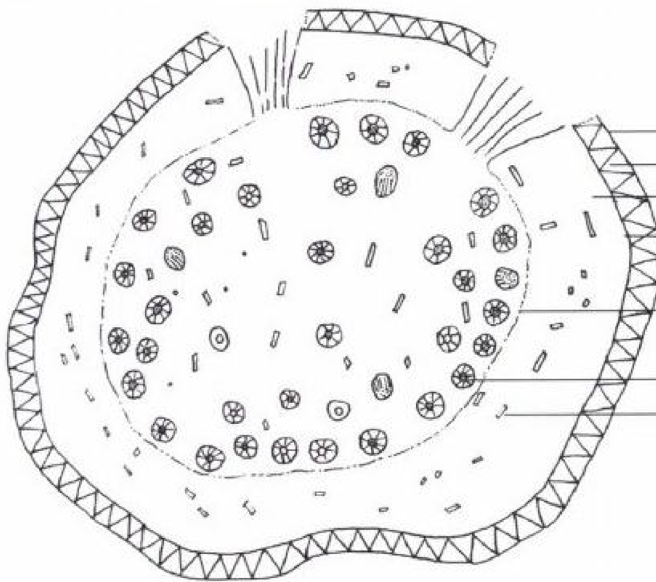
1. 淀粉粒	极多。单粒棒槌形、瓶形、肾形、长椭圆形、菱角形、长卵形或类圆形（小粒），长24~44μm，直径8~27μm，脐点点状、短缝状或三叉状，层纹多数不明显；复粒2~8分粒组成。偏光下呈黑十字状。
2. 分泌细胞	大多破碎。完整者呈类圆形或椭圆形，直径40~48μm，壁稍厚，纹孔可见，胞腔内含橙红色或棕红色树脂状分泌物。
3. 薄壁细胞	淡黄棕色。类圆形、类多角形、纺锤形或不规则形，直径64~80μm，壁稍厚，约至5μm。薄壁细胞中偶见细小草酸钙方晶，呈方形、梭形或长方形。
4. 纤维	成束或单个散离。细长，直径20~37μm，壁稍厚，胞腔内充满红棕色物质。

射干 Shegan

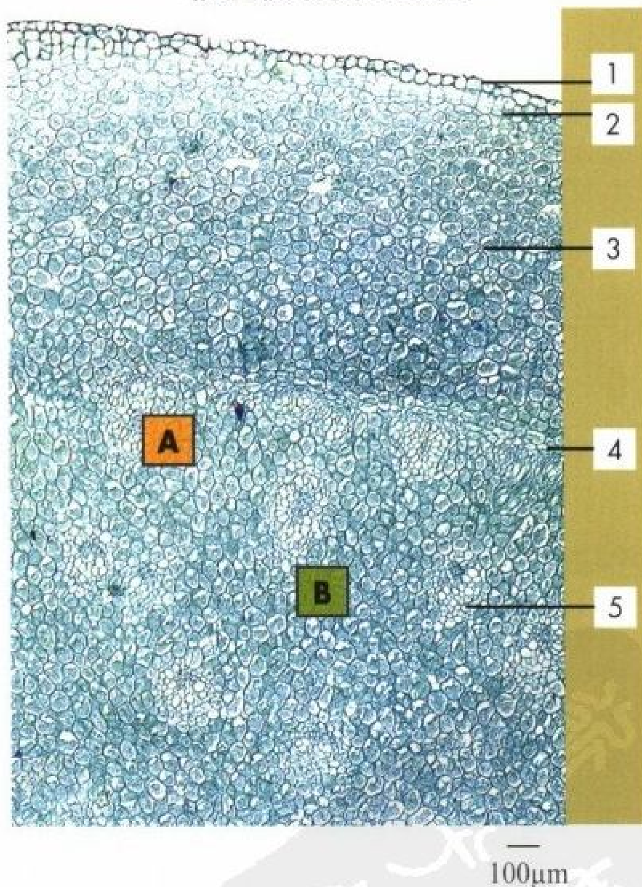


The dried rhizome of *Belamcanda chinensis* (L.) DC. (Fam. Iridaceae).
鸢尾科植物射干的干燥根茎。

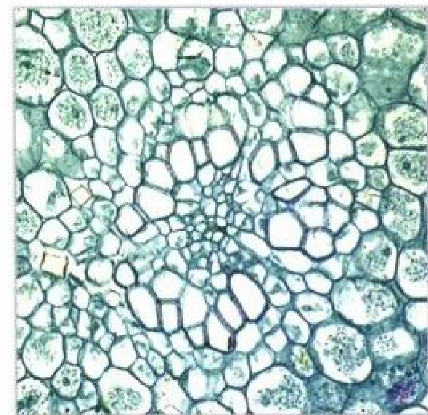
Sketch of transverse section of rhizome
根茎横切面简图



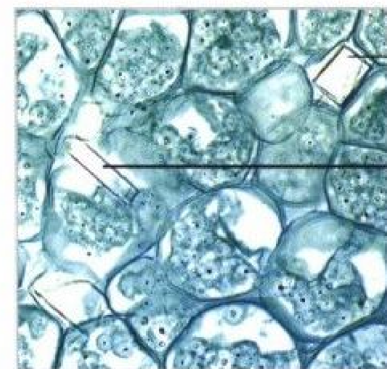
Transverse section of rhizome
根茎横切面组织图



A Amphivasal vascular bundle
周木型维管束



B Columnar crystals of calcium oxalate
草酸钙柱晶



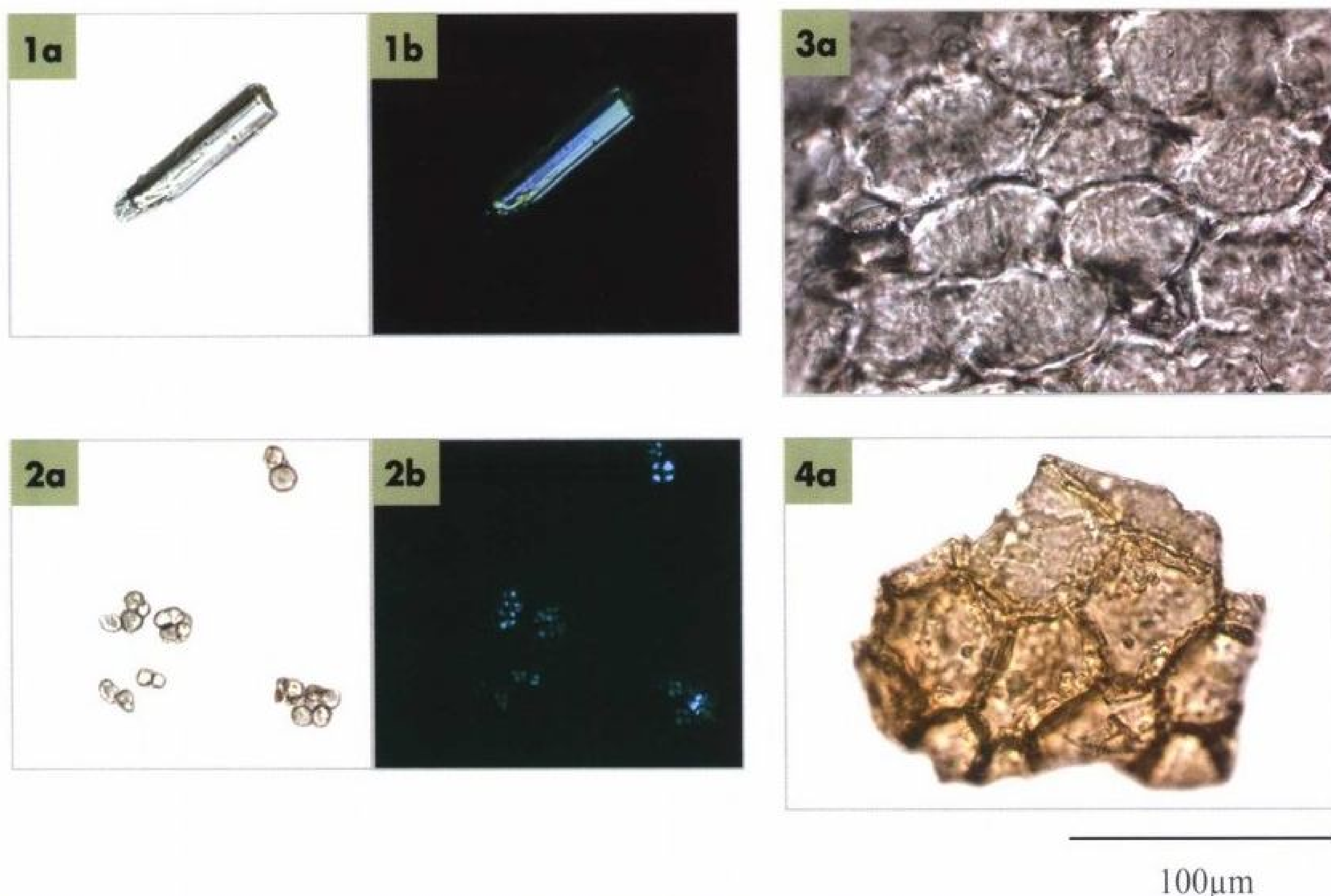
Transverse section of rhizome

1. Epidermis	Sometimes remained.
2. Cork	Many rows of cells.
3. Cortex	With rare leaf-trace vascular bundles.
4. Endodermis	Indistinct.
5. Vascular Bundles of Stele	Amphivasal and collateral type, densely arranged near the outer side.
6. Columnar Crystals of Calcium Oxalate	Located in parenchymatous cells.

根茎横切面组织图注

1. 表皮	有时残存。
2. 木栓层	细胞多列。
3. 皮层	稀有叶迹维管束。
4. 内皮层	不明显。
5. 中柱维管束	为周木型维管束及外韧型，靠外侧排列较紧密。
6. 草酸钙柱晶	位于薄壁细胞中。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Columnar Crystals of Calcium Oxlate	Abundant, columnar, mostly broken, complete crystals 49~315μm long, about up to 49μm in diameter. Bright pink or blueish-green color separated by polychrome observed under a polarizing microscope.
2. Starch Granules	Simple granules rounded or ellipsoid, 2~17μm in diameter, hilum pointed, compound granules scarce composed of 2~5 components.
3. Parenchymatous Cells	Subrounded or ellipsoid, with walls slightly thickened or beaded thickened, with simple pits. Black cruciate shape under a polarizing microscope.
4. Cork Cells	Brown, polygonal in surface, with walls thin, slightly undulantly curved, some containing brown masses.

图注

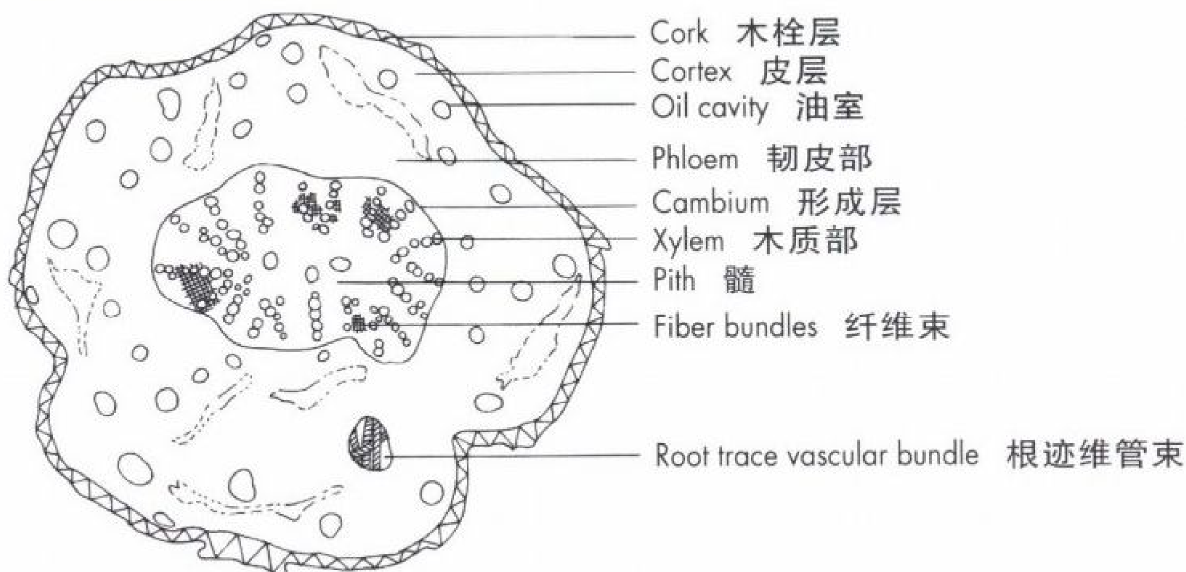
1. 草酸钙柱晶	较多，棱柱形，多已破碎，完整者长49~315μm，直径约至49μm。偏光显微镜下柱晶呈亮粉色或蓝绿色间多彩状。
2. 淀粉粒	单粒圆形或椭圆形，直径2~17μm，脐点点状；复粒极少，由2~5分粒组成。偏光显微镜下可见黑十字状。
3. 薄壁细胞	类圆形或椭圆形，壁稍厚或连珠状增厚，有单纹孔。
4. 木栓细胞	棕褐色，表面观多角形，壁薄，微波状弯曲，有的含棕色物。



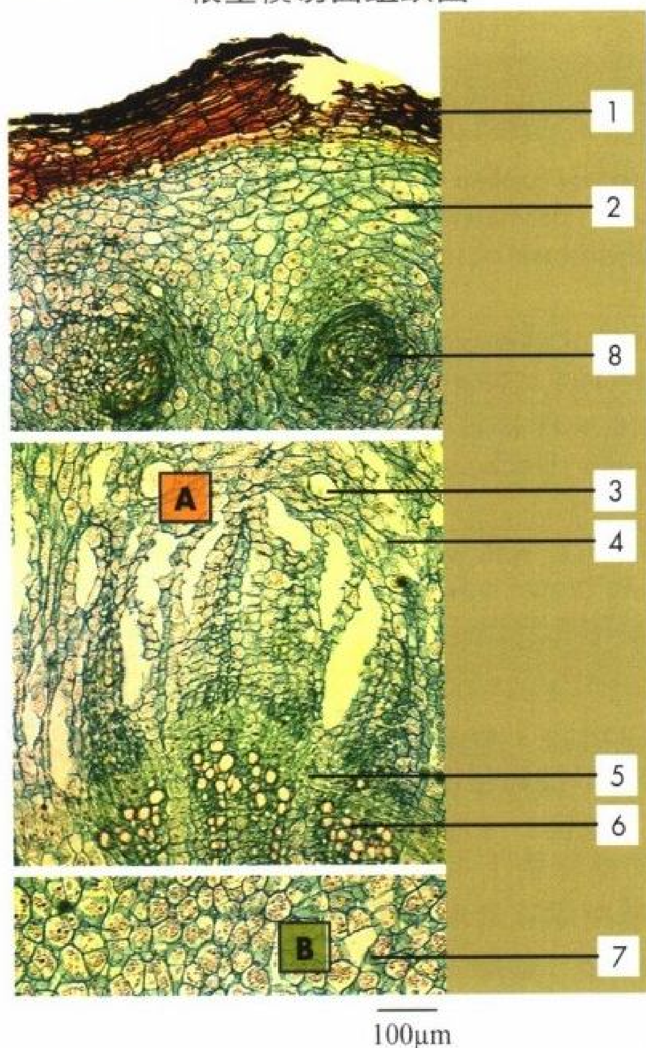
川芎 Chuanxiong

The dried rhizome of *Ligusticum chuanxiong* Hort. (Fam. Umbelliferae).
伞形科植物川芎的干燥根茎。

Sketch of transverse section of rhizome 根茎横切面简图



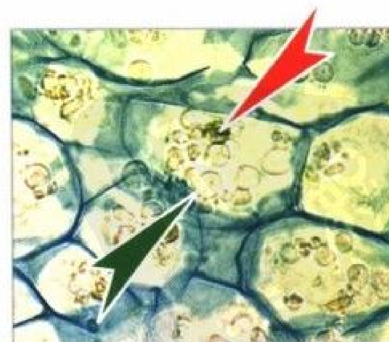
Transverse section of rhizome 根茎横切面组织图



A *Oil cavities* 油室



B *Parenchymatous cells containing crystals of calcium oxalate "" "and starch grains ""* 薄壁细胞含草酸钙晶体""和淀粉粒""



Transverse section of rhizoma

1. Cork	Consisting of over 10 layers of cells.
2. Cortex	Narrow, scattered with root-trace vascular bundles.
3. Oil Cavities	Scattered in parenchyma.
4. Phloem	Broad.
5. Cambium	In a ring, undulate or irregularly polygonal.
6. Xylem	Vessels in xylem polygonal or subrrounded, mostly uniserial or arranged in V-shape.
7. Pith	Relatively large.
8. Root Trace Vascular Bundles	Parenchymatous cells containing crystals of calcium oxalate and starch granules.

根茎横切面组织图注

1. 木栓层	为10余列细胞。
2. 皮层	狭窄，散有根迹维管束。
3. 油室	散生于薄壁组织中。
4. 韧皮部	宽广。
5. 形成层	成环，波状或不规则多角形。
6. 木质部	导管多角形或类圆形，大多单列或排成“V”形。
7. 髓部	较大。
8. 根迹维管束	薄壁细胞含草酸钙晶体和淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Cork cells	Dark yellowish-brown, usually several layers of cells overlapped, subpolygonal in surface view, with thin walls.
2. Oil cavities	Mainly broken, fragments of oil cavities and numerous droplets of volatile oil observed, usually mixed with starch granules.
3. Vessels	Mainly spiral vessels, scalarform and reticulate vessels also existed, some spiral vessels with slightly thickened-walls connected like reticulate spiral vessels.
4. Starch granules	Abundant, simple granules ellipsoid, long-rounded, oval or kidney-shaped, hilum pointed, long cleft or V-shaped, compound granules few, consisting of 2~4 components. Black, cruciate shape observed under a polarizing microscope.

图注

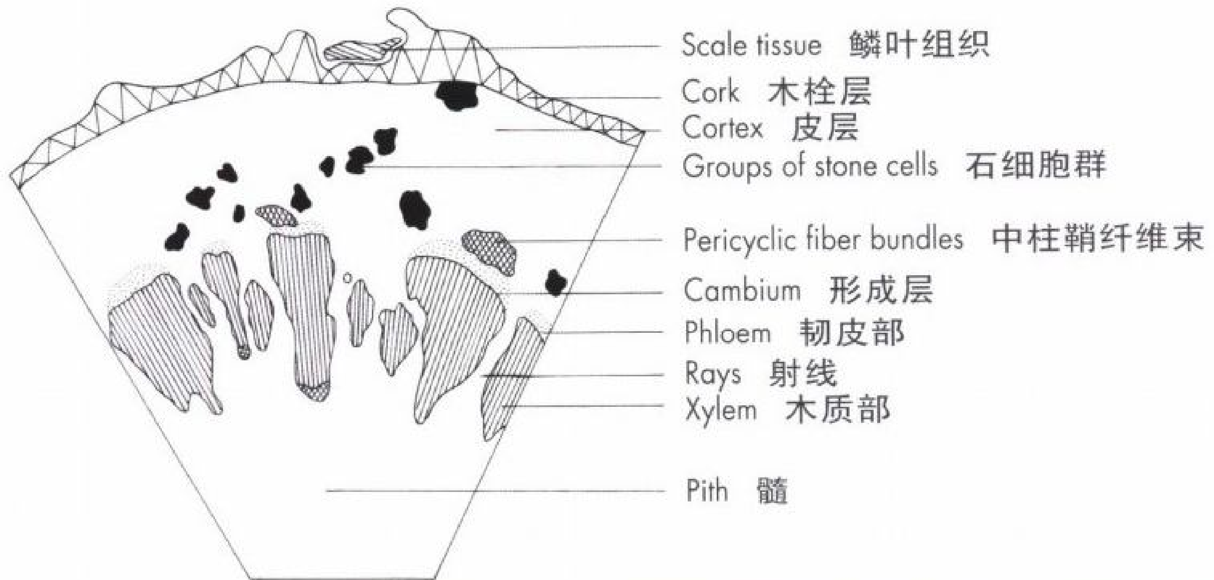
1. 木栓细胞	深黄棕色，常多层重叠，表面观呈类多角形，壁薄。
2. 油室	多已破碎，可见油室碎片及众多挥发油油滴，常与淀粉粒混合。
3. 导管	主为螺纹导管，亦有梯纹及网纹导管，有的螺纹导管增厚壁互相联结，似网状螺纹导管。
4. 淀粉粒	较多。单粒椭圆形、长圆形、卵圆形或肾形，脐点点状，长缝状或人字状，复粒少数，由2~4分粒组成。偏光显微镜下呈黑十字状。

黄连 Huanglian

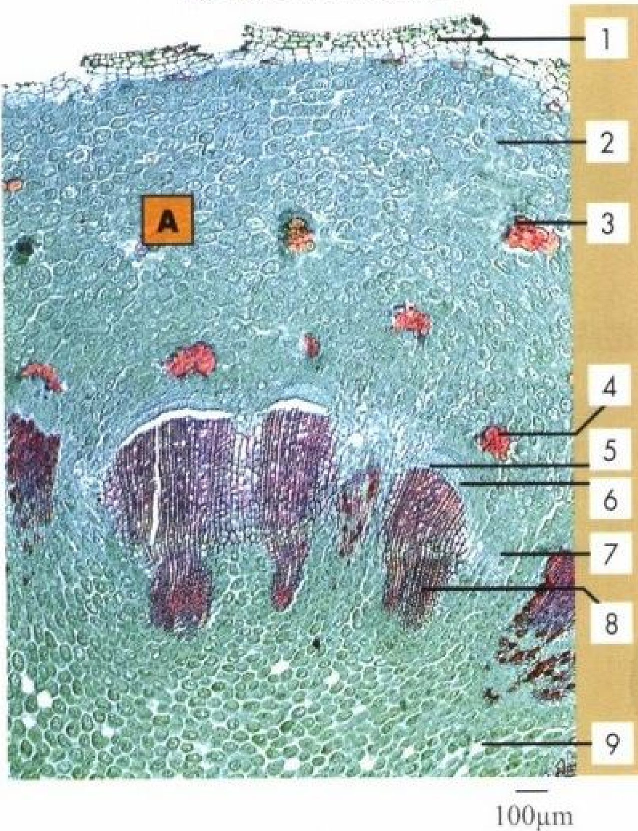


The dried rhizome of *Coptis chinensis* Franch. (Fam. Ranunculaceae).
毛茛科植物黄连的干燥根茎。

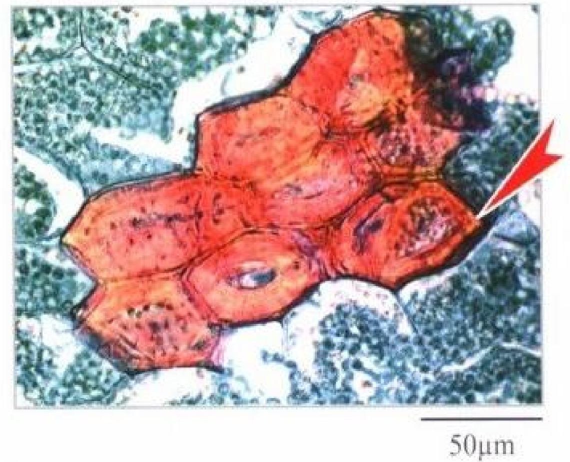
Sketch of transverse section of rhizome
根茎横切面简图



Transverse section of the rhizome
根茎横切面组织图



A Stone cells
石细胞



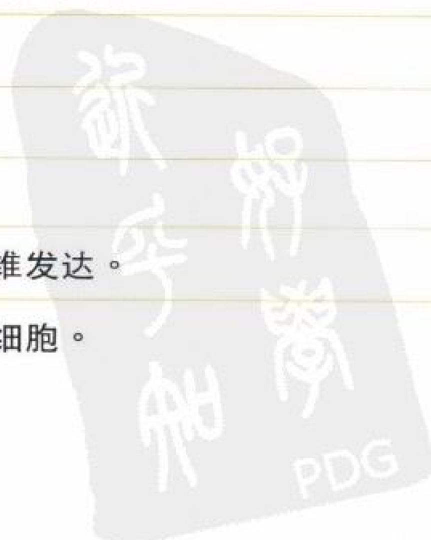


Transverse section of rhizome

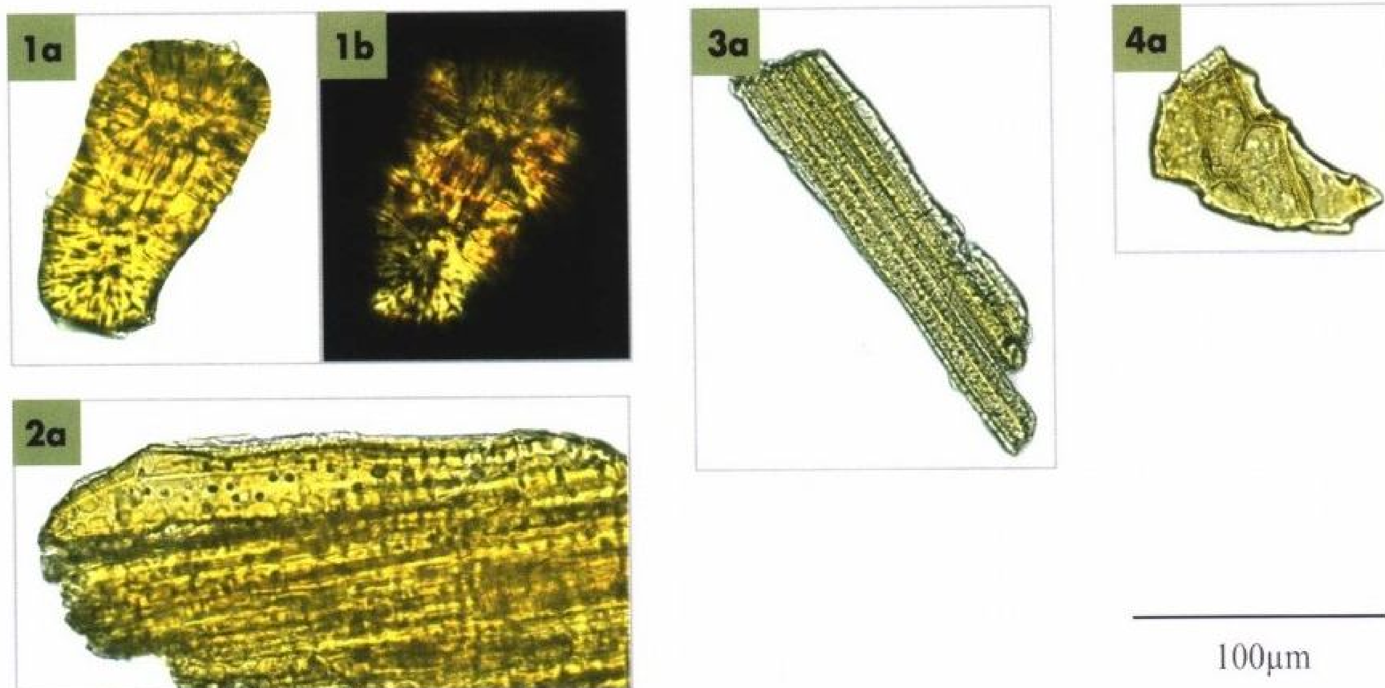
1. Cork	Several rows of cells.
2. Cortex	Relatively broad, stone cells singly scattered or grouped.
3. Stone Cells	Yellow, single or in groups, subrounded, rectangular, fusiform, sub-polygonal or elliptical, 25~64μm in diameter, up to 102μm long, pit and pit canals distinct, some cells striation observed.
4. Pericyclic Fibre Bundles	Sometimes accompanied with a few stone cells, both of them yellow.
5. Cambium	Interfascicular cambium indistinct.
6. Phloem	Cresent.
7. Pith Ray	Relatively broad.
8. Xylem	Yellow, and all lignified, xylem fibres developed.
9. Pith	Consisting of parenchymatous cells, without stone cells absent.

根茎横切面组织图注

1. 木栓层	为数列细胞。
2. 皮层	较宽，石细胞单个或成群散在。
3. 石细胞	黄色，单个或成群，类圆形、长方形、纺锤形、类多角形或椭圆形，直径25~64μm，长至102μm，纹孔及孔沟明显，有的可见层纹。
4. 中柱鞘纤维束	或伴有少数石细胞，均显黄色。
5. 形成层	束间形成层不明显。
6. 韧皮部	月牙形。
7. 髓射线	较宽。
8. 木质部	黄色，均木化，木纤维发达。
9. 髓部	均为薄壁细胞，无石细胞。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone Cells	Yellow or yellowish-brown, subsquare, subrectangular, subrounded or polygonal, 45~75μm long, several up to above 100μm, thickened walls, pit canals and pits distinct, some cells striation observed. Bright yellowish color observed under a polarizing microscope.
2. Phloem Fibers	In bundles, yellow, relatively thickened walls, cleft and pointed pits observed.
3. Xylary Fibers	In bundles, relatively thickened walls, 10~13μm in diameter. Yellowish-green in color observed under a polarizing microscope.
4. Squama Epidermal Cells	Greenish-yellow or yellowish-brown, slightly rectangular or long polygonal, with pits, walls slightly undulant curved or thickened like continuous beads.

图注

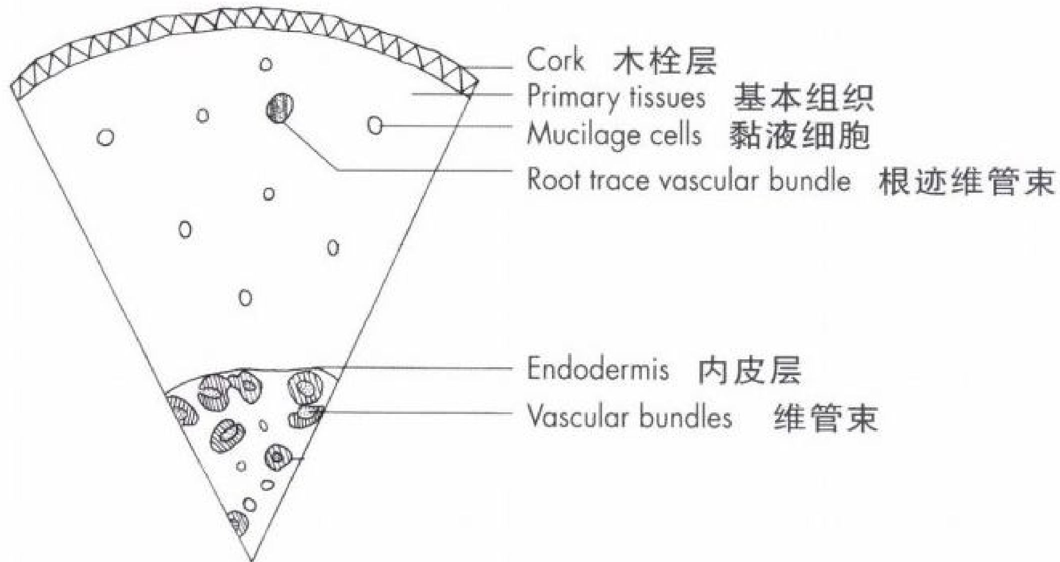
1. 石细胞	黄色或黄棕色，类方形、类长方形、类圆形或多角形，长45~75μm，少数可达100μm以上，壁厚，孔沟、纹孔明显，有的可见层纹。偏光显微镜下呈亮黄色。
2. 韧皮纤维	成束，黄色，壁较厚，可见裂缝状、点状纹孔。
3. 木纤维	成束，壁稍厚，直径10~13μm。偏光显微镜下呈黄绿色。
4. 鳞叶表皮细胞	绿黄色或黄棕色，略呈长方形或长多角形，具纹孔，细胞壁微波状弯曲或连珠状增厚。

仙茅 Xianmao

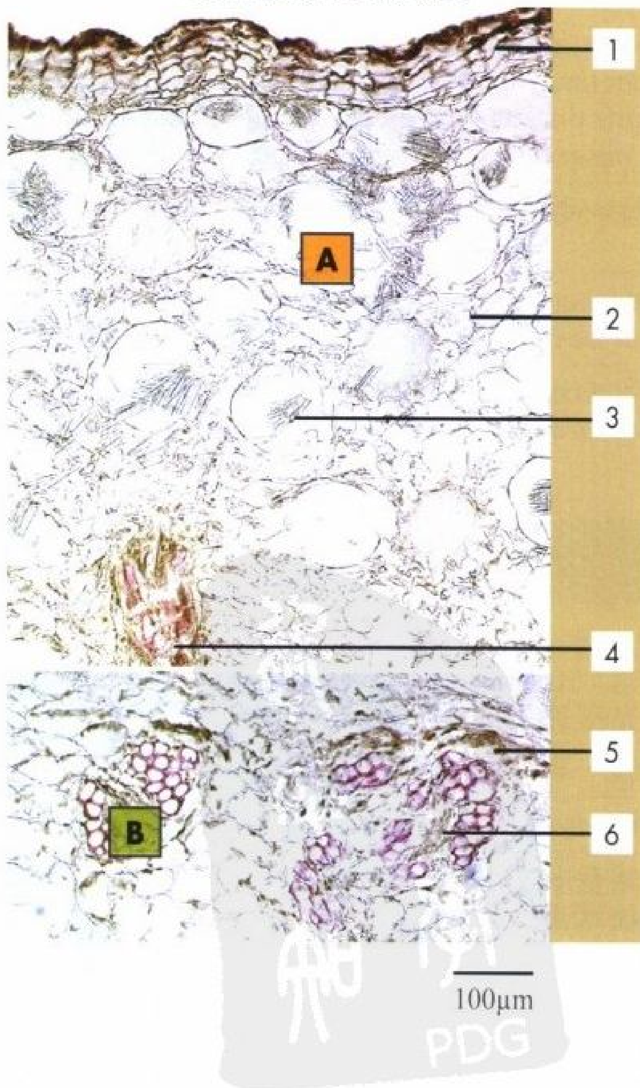


The dried rhizome of *Curuligo orchioides* Gaertn. (Fam. Amarylidaceae).
石蒜科植物仙茅的干燥根茎。

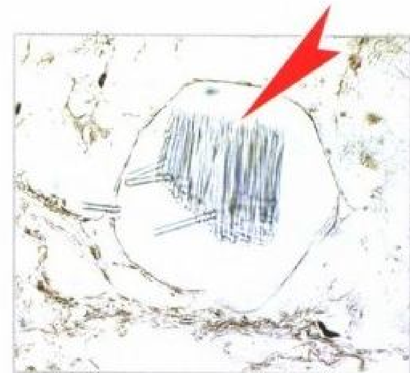
Sketch of transverse section of rhizome
根茎横切面组织简图



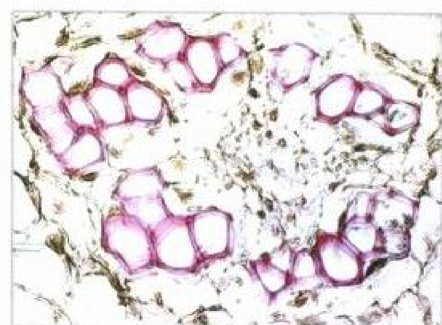
Transverse section of rhizome
根茎横切面组织图



A *Mucilage cells containing raphides of calcium oxalate*
黏液细胞含有草酸钙针晶束



B *Stele vascular bundle*
中柱维管束

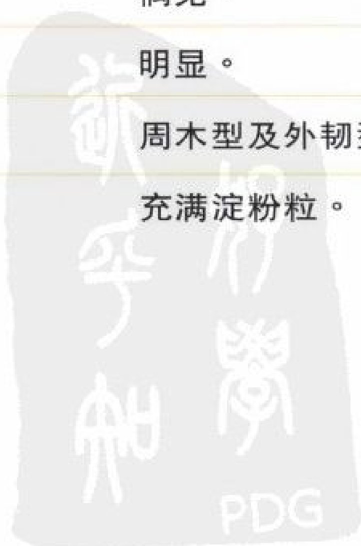


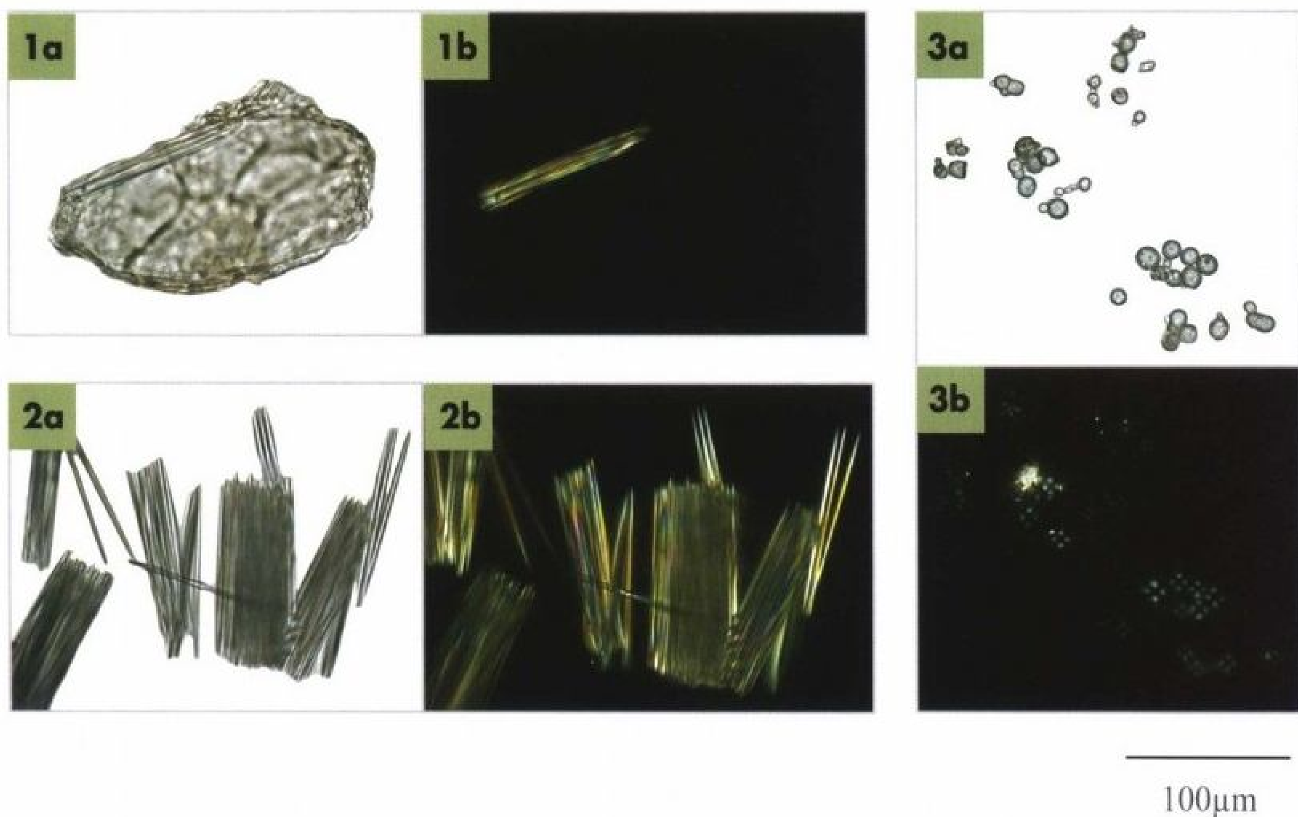
Transverse section of rhizome

1. Cork	3~10 rows of cells.
2. Primary tissues	Broad, root trace vascular bundles occasionally observed, some cells at outside containing prisms of calcium oxalate.
3. Mucilage cells	Scattered in parenchymata, subrounded, 60~200μm in diameter, containing raphides of calcium oxalate, 50~180μm long.
4. Root trace vascular bundle	Occasionally observed.
5. Endodermis	Distinct.
6. Stele vascular bundles	Amphivasal or collateral vascular bundles, scattered.
Parenchymatous cells	Filled with starch granules.

根茎横切面组织图注

1. 木栓层	3~10列细胞。
2. 基本组织	宽广，偶见根迹维管束，外缘有的细胞含草酸钙方晶。
3. 黏液细胞	散在于薄壁组织中，类圆形，直径60~200μm，内含草酸钙针晶束，长50~180μm。
4. 根迹维管束	偶见。
5. 内皮层	明显。
6. 中柱维管束	周木型及外韧型，散列。
薄壁细胞	充满淀粉粒。





Notes

1. Mucilage cells	60~160µm in diameter and containing raphides of calcium oxalate. Polychrome in color observed under a polarizing microscope.
2. Raphides of calcium oxalate	Abundant, present in large mucilage cells singly or in bundles; 80~170µm in length; 3~6µm in diameter; the endings tapering.
3. Starch granules	Abundant; simple granules spherical, elliptical, ovate or helmet-shaped; 3~21µm in diameter; hilum mostly clear, dotted or cleft-shaped, some granules slightly sunken or cleft-shaped in the center; striations unclear; compound granules easily seen, composed of 2~3 components. Black, cruciate shape observed under a polarizing microscope.

图注

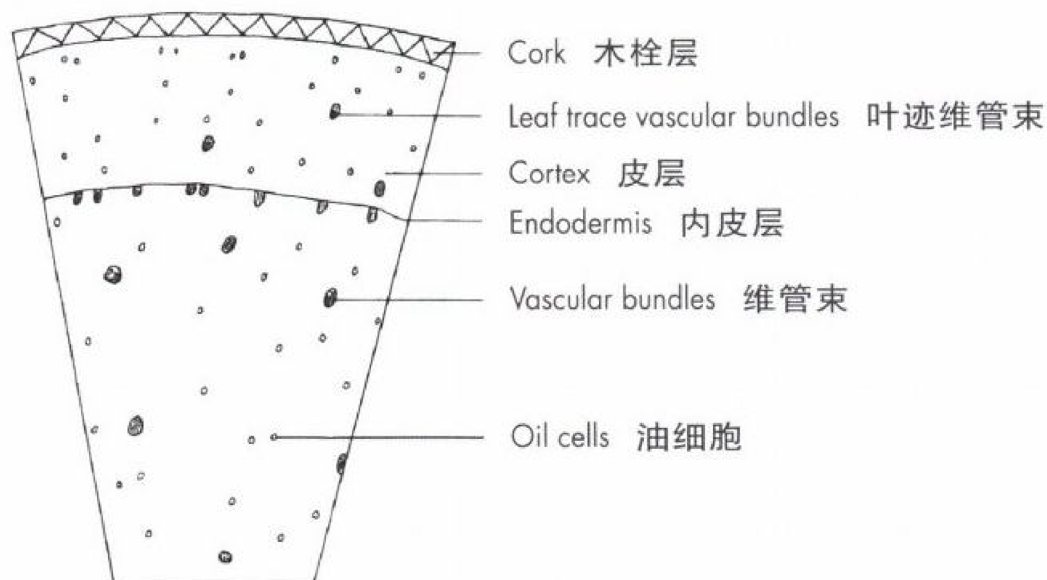
1. 黏液细胞	直径60~160µm，内含草酸钙针晶束。偏光下呈多彩色。
2. 草酸钙针晶	众多。单根或成束，散在或存在于大型黏液细胞中。长80~170µm，直径3~6µm，末端尖锐。
3. 淀粉粒	众多。单粒呈圆球形、椭圆形、卵圆形或盔帽形，直径3~21µm，脐点大多可见，点状或裂缝状，有的中心部略为下陷或呈裂痕状，层纹不明显；复粒易见，2~3分粒组成。偏光下呈黑十字状。

莪术 Ezhu

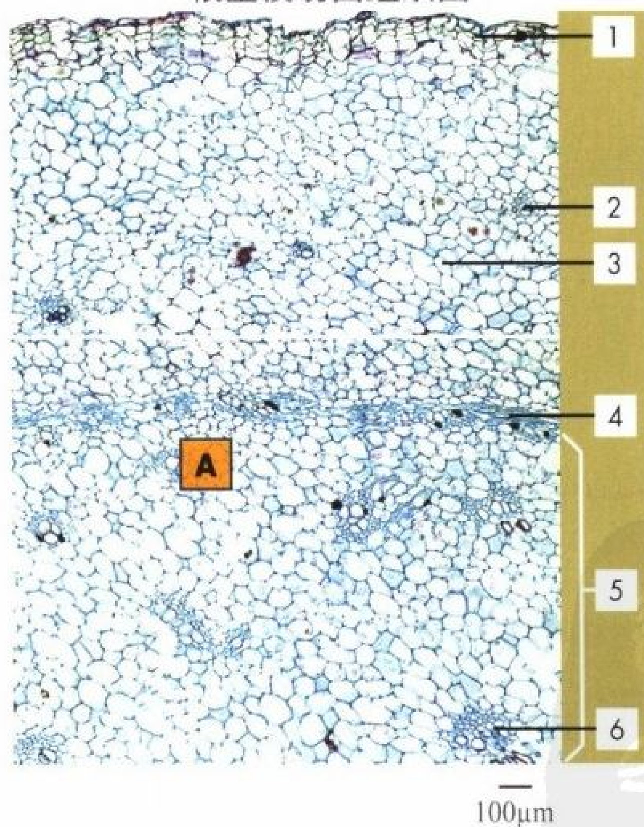


The dried rhizome of *Curcuma phaeocaulis* Val. (Fam. Zingiberaceae).
姜科植物蓬莪术的干燥根茎。

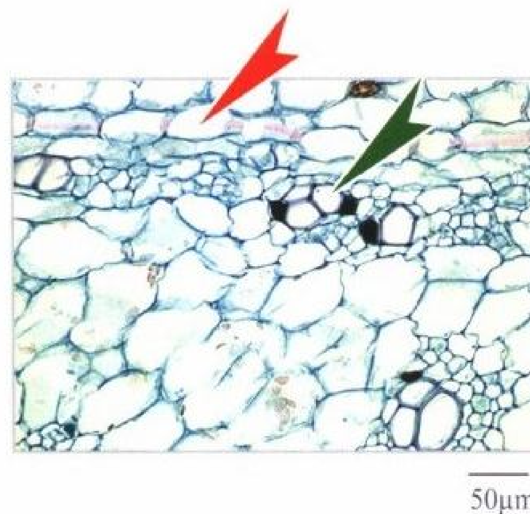
Sketch of transverse section of rhizome 根茎横切面简图



Transverse section of rhizome 根茎横切面组织图



A Endodermis and vascular bundles in stele 内皮层"↗"和中柱维管束"↗"



Transverse section of rhizome

1. Cork	Several rows of cells; sometimes removed.
2. Leaf-trace vascular bundles	Mostly collateral.
3. Cortex	Scattered with leaf-trace vascular bundles.
4. Endodermis	Distinct.
5. Stele	Broad.
6. Vascular bundles	Collateral; scattered; some of them relatively small along pericycle part and arranged densely.
Parenchymatous cells	Filled with the mass of gelatinous starch granules; the cells containing golden-yellow oily contents scattered in parenchyma.

根茎横切面组织图注

1. 木栓层	数列细胞，有时已除去。
2. 叶迹维管束	多为外韧型。
3. 皮层	散有叶迹维管束。
4. 内皮层	明显。
5. 中柱	较宽。
6. 维管束	外韧型，散在，沿中柱鞘部位的维管束较小，排列较密。
薄壁细胞	充满糊化的淀粉粒团块，薄壁组织中有含金黄色油状物的细胞散在。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Mostly gelatinous masses.
2. Oil cells	Few. Elliptical or round; walls thin and lumina full of yellow oily mass.
3. Vessels	Mainly spiral, scalariform; few vessels accompanied by rod-shaped fibre groups; fibre walls with distinct pits; vessels and fibres all lignified.
4. Non-glandular hairs	Mostly broken into fragments, complete ones rare.

图注

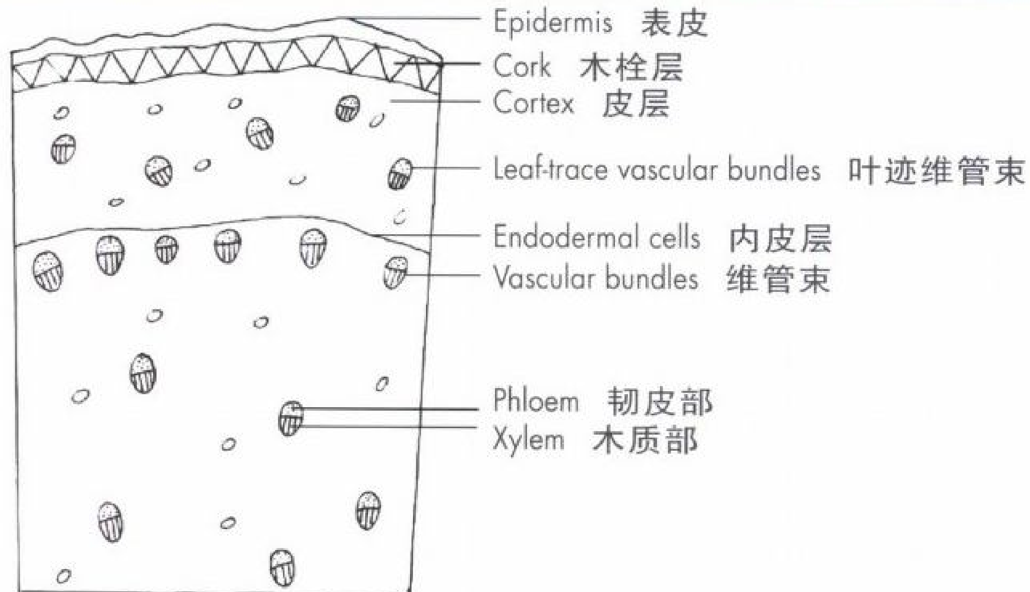
1. 淀粉粒	大多糊化成团块。
2. 油细胞	少数。呈椭圆形或圆形，壁薄，胞腔内充满黄色油状物。
3. 导管	多为螺纹、梯纹，少数导管伴有杆状纤维群，纤维壁孔明显，导管及纤维均木化。
4. 非腺毛	多成碎片，完整者极少。

姜黄 Jianghuang

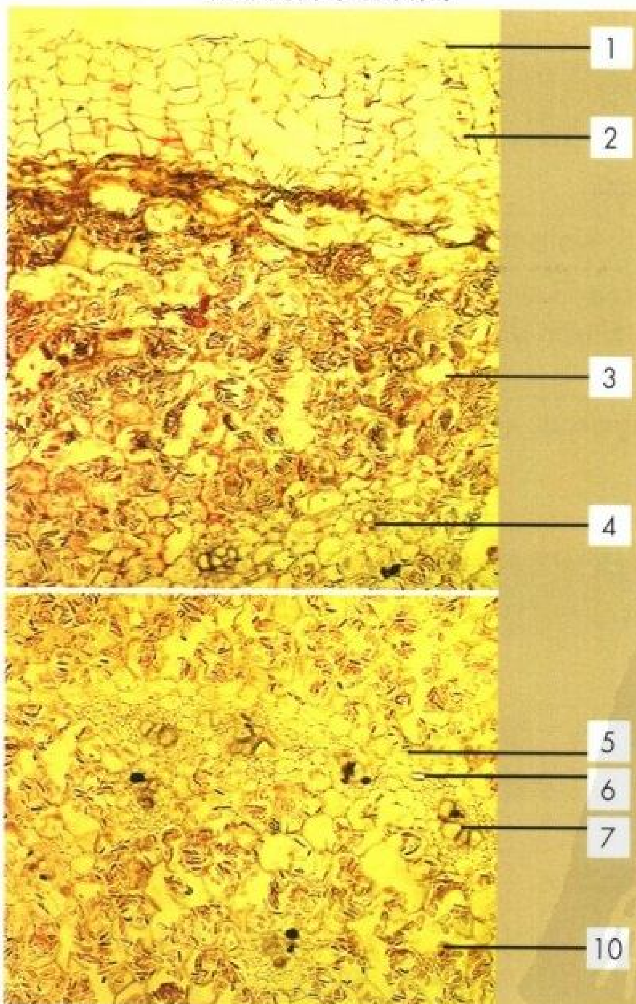


The dried rhizome of *Curcuma longa* L. (Fam. Zingiberaceae).
姜科植物姜黄的干燥根茎。

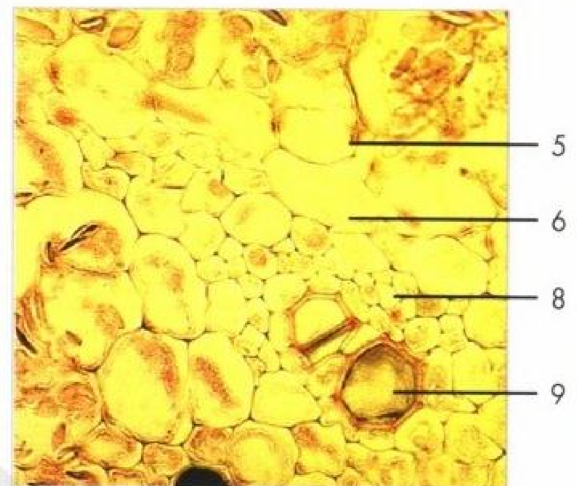
Sketch of transverse section of rhizome
根茎横切面简图



Transverse section of rhizome
根横切面组织图



A Endodermis and vascular bundle
内皮层和维管束



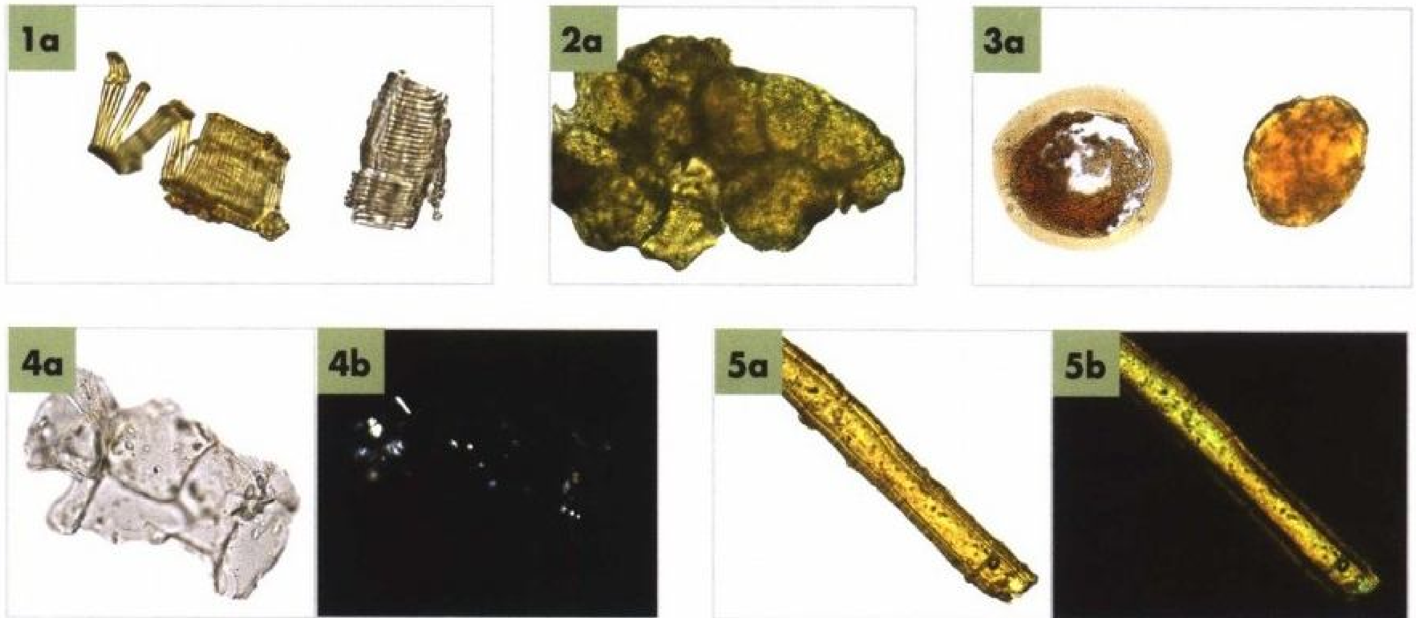
Transverse section of rhizome

1. Epidermis	1 row of cells; flattened and thin-walled.
2. Cork	6~8 rows of cells; located in the outside of cortex near the epidermis; cells flattened, thin-walled and regularly arranged.
3. Cortex	Broad; with leaf-trace vascular bundles.
4. Leaf-trace vascular bundles	Scattered.
5. Endodermal cells	With distinct Casparian dots.
6. Pericycle	Consisting of 1~2 rows of parenchymatous cells.
7. Vascular bundles	Collateral; scattered; most of them near pericycle; gradually decreasing inwards.
8. Phloem	Outer part of vascular bundle.
9. Xylem	Inner part of vascular bundle.
10.Parenchymatous cells	Containing oil droplets, starch granules and reddish-brown pigment.

根茎横切面组织图注

1. 表皮	为1列细胞，扁平，壁薄。
2. 木栓层	6~8列细胞，位于皮层外侧近表皮处，细胞扁平，壁薄，排列较整齐。
3. 皮层	宽广，有叶迹维管束。
4. 叶迹维管束	散在。
5. 内皮层	凯氏点明显。
6. 中柱鞘	为1~2列薄壁细胞。
7. 维管束	为外韧型，散列，近中柱鞘处较多，向内渐减少。
8. 韧皮部	位于维管束外侧。
9. 木质部	位于维管束内侧。
10.薄壁细胞	含油滴、淀粉粒及红棕色色素。

Main Powder Characteristics
主要粉末显微特征



100μm

Notes

1. Vessels	Scalariform and annular vessels; pale yellow in color.
2. Parenchymatous cells	Yellow; mostly single scattered or several aggregated. Subrounded, polygonal, subrectangular or irregular in shape; surface uneven; filled with gelatinized or ungelatinized starch granules.
3. Oil cells	Several; elliptical or oval; relatively big; with relatively thin walls and full of yellow or orange oily masses.
4. Prisms of calcium oxalate	Several; existed in parenchymatous cells; subsquare or pole-like in shape; usually uneasily observed for the interruption of yellow pigment. Brightly orange color observed under a polarizing microscope.
5. Non-glandular hairs	Yellow to dark yellow; unicellular; usually broken; with pointed tip. Brightly yellow under a polarizing microscope.

图注

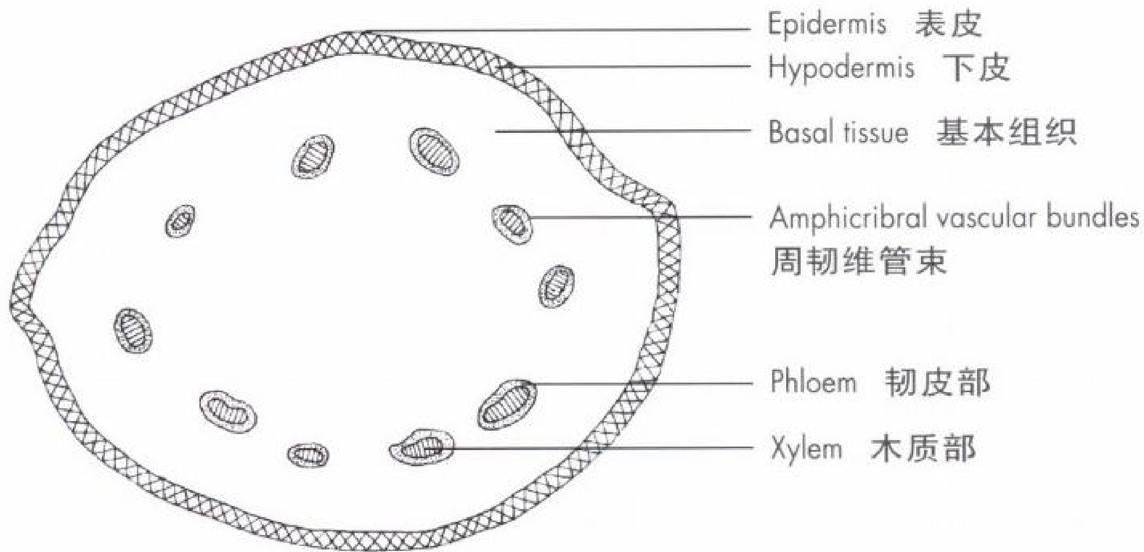
1. 导管	梯纹及环纹导管，淡黄色。
2. 薄壁细胞	黄色，大多单个散离，也有数个相集。呈类圆形、多角形、类长方形或不规则形，表面不平坦，内充满糊化或不完全糊化的淀粉粒。
3. 油细胞	少数，椭圆形或卵圆形，较大，壁较薄，胞腔内充满黄色或橙黄色油状物。
4. 草酸钙方晶	少数，存在于薄壁细胞中，呈类方形或杆形，常因黄色色素干扰不易观察。偏光显微镜下呈亮橙黄色。
5. 非腺毛	黄色至深黄色，单细胞，多碎断，顶端尖。偏光下亮黄色。

绵马贯众 Mianmaguanzhong

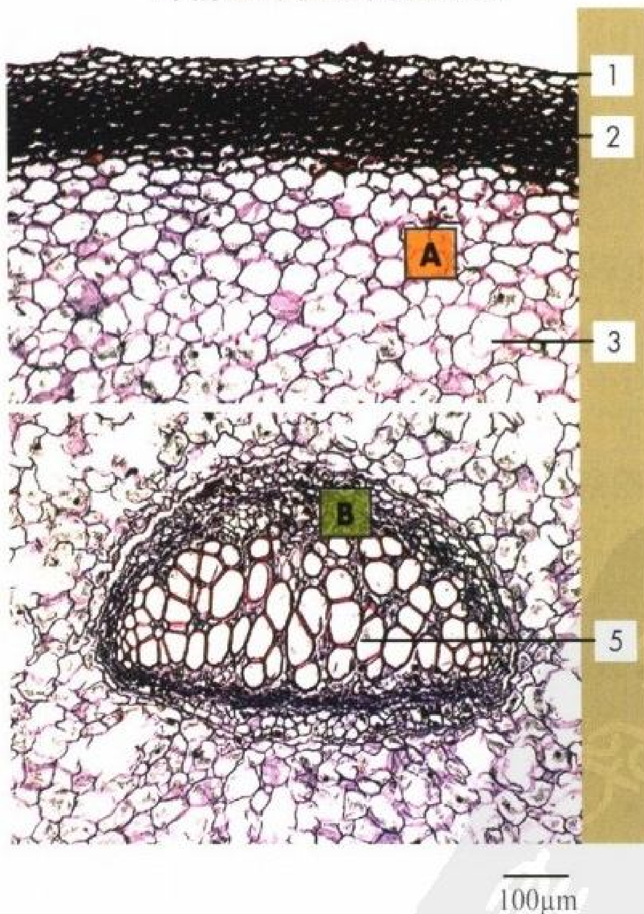


The dried rhizome and petiolar base of *Dryopteris crassirhizoma* Nakai. (Fam. Dryopteridaceae).
鳞毛蕨科植物粗茎鳞毛蕨的干燥根茎及叶柄残基。

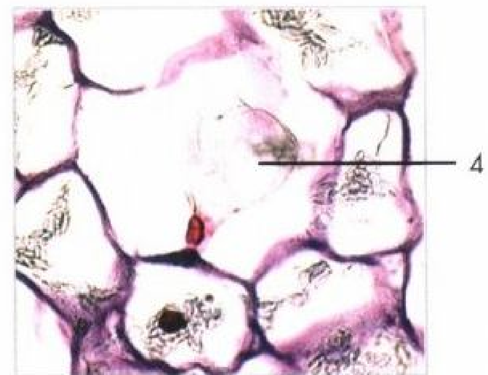
Sketch of transverse section of petiolar base
叶柄基部横切面简图



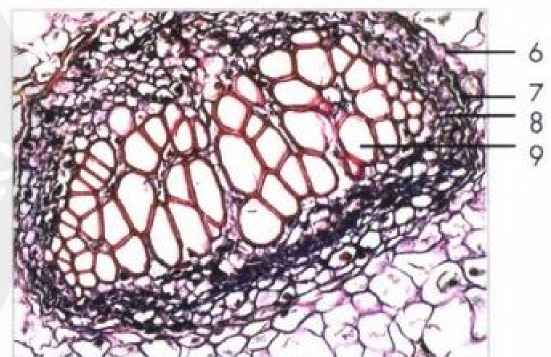
Transverse section of petiolar base
叶柄基部横切面组织图



A Interstice glandular hairs
间隙腺毛



B Amphicribral vascular bundles
周韧型维管束



Transverse section of petiolar base

1. Epidermis	Consisting of 1 row of small cells; with thickened outer walls; usually fallen off.
2. Hypodermis	Consisting of over 10 rows of thick-walled cells; polygonal; brown to dark-brown.
3. Basal tissue	Cells arranged sparsely.
4. Intercellular glandular hairs	Unicellular glandular hairs present in the intercellular space; head globose or pyriform; containing brown secretions.
5. Amphicribral vascular bundles	5~13; arranged in a ring.
6. Endodermis	Flat and small; 1 row; surrounding vascular bundles; casparian dots distinct; with oil droplets scattered.
7. Pericyclic	1~2 rows of parenchymatous cells.
8. Phloem	Surrounding xylem.
9. Xylem	In the central part of vascular bundle.
Parenchymatous cells	Containing brown contents and starch granules.

叶柄基部横切面组织图注

1. 表皮	为1列外壁增厚的小形细胞，常脱落。
2. 下皮	为10余列多角形厚壁细胞，棕色至褐色。
3. 基本组织	细胞排列疏松。
4. 间隙腺毛	细胞间隙中有单细胞间隙腺毛，头部呈球形或梨形，内含棕色分泌物。
5. 周韧维管束	5~13个，环列。
6. 内皮层	扁小，1列，在维管束周围，凯氏点明显，有油滴散在。
7. 中柱鞘	薄壁细胞1~2列。
8. 韧皮部	环绕在木质部四周。
9. 木质部	位于维管束中心部位。
薄壁细胞	含有棕色物和淀粉粒。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Intercellular gland hairs	Unicellular; mainly broken; the complete ones being elliptical, subround or long-ovate in shape; bases elongated to petiole-like form; some containing yellow or yellowish-brown secretions.
2. Tracheids	Mostly scalariform tracheids; 12~53μm in diameter; few reticulate tracheids with diameter up to 75μm.
3. Hypodermal fibres	Present in bundles or scattered singly; brown or yellowish-brown; quite long and often broken; 12~33μm in diameter with the walls 2.5~7μm; the thicker ones showing sparsely obliquely pits.
4. Starch granules	Abundant; simple granules round, elliptical, wide-ovate or long rectangular-rounded; 2~8μm in diameter; hilum and striations unclear. Black cruciate shape observed under a polarizing microscope.

图注

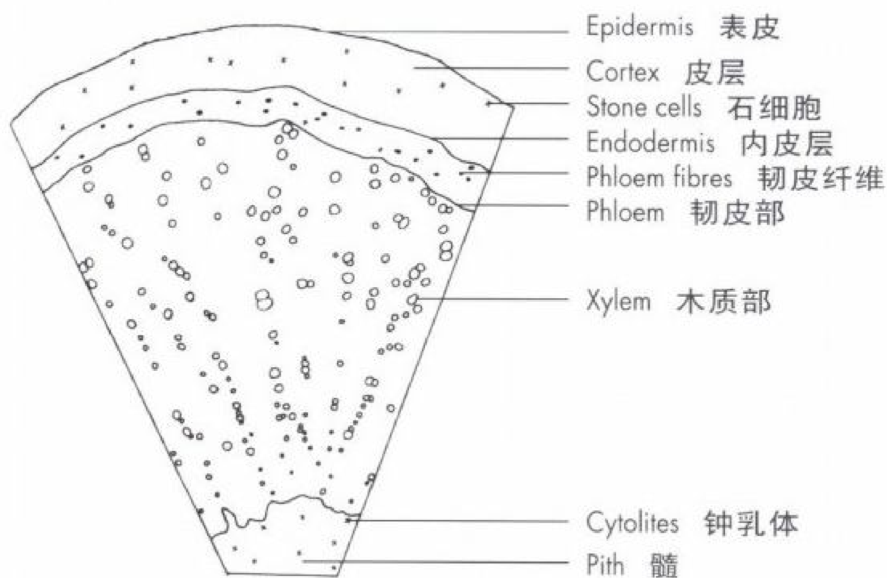
1. 间隙腺毛	单细胞，多破碎，完整者呈椭圆形、类圆形或长卵形，基部延长似柄状，有的含黄色或黄棕色分泌物。
2. 管胞	主为梯纹管胞，直径12~53μm，少数为网纹管胞，直径至75μm。
3. 下皮纤维	成束或单个散在，棕色或黄棕色。较长，多碎断，直径12~33μm，壁厚2.5~7μm，较粗者可见稀疏斜纹孔。
4. 淀粉粒	较多。单粒圆形、椭圆形、广卵形或长矩圆形，直径2~8μm，脐点及层纹不明显。偏光显微镜下呈黑十字状。



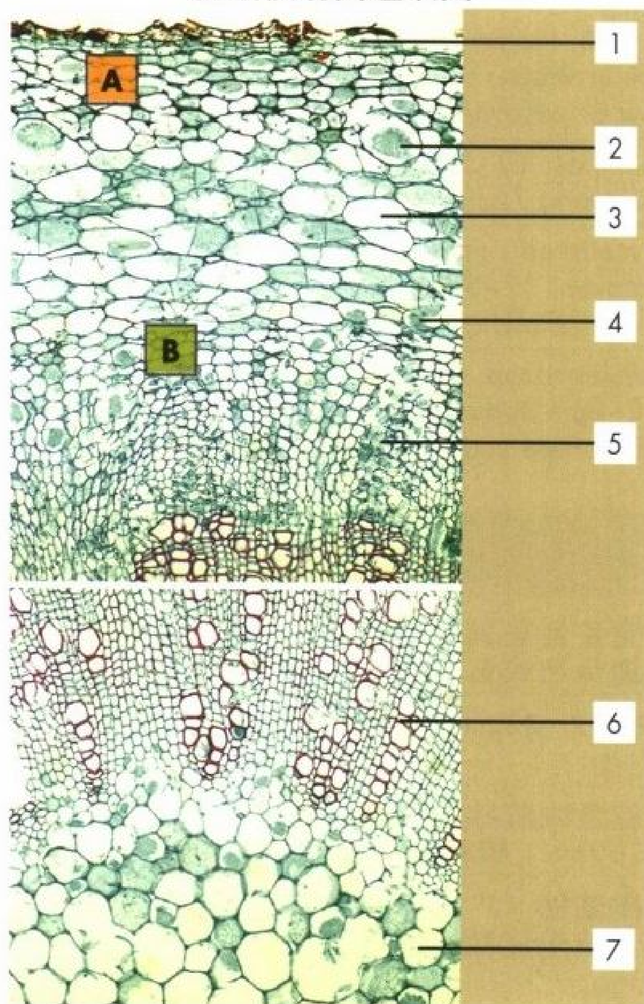
南板蓝根 Nanbanlangen

The dried rhizome of *Baphicacanthus cusia* (Nees) Bremek. (Fam. Acanthaceae).
爵床科植物马蓝的干燥根茎。

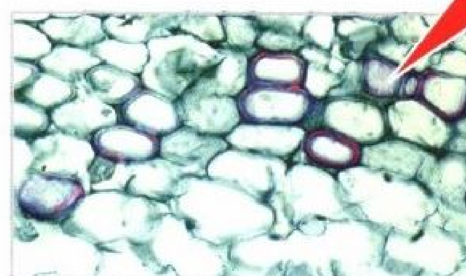
Sketch of transverse section of rhizome
根茎横切面简图



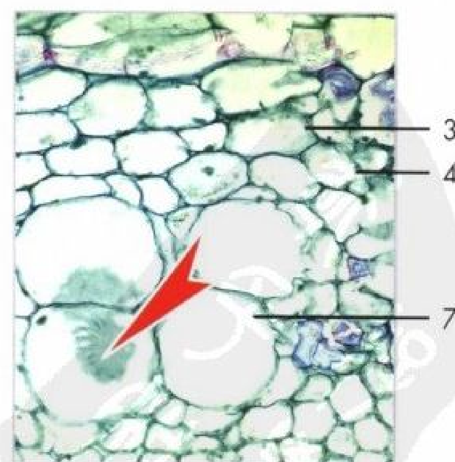
Transverse section of rhizome
根茎横切面组织图



A *Stone cells*
石细胞



B *Cytolites*
钟乳体



Transverse section of rhizome

1. Epidermis	Consisting of several rows of cells, containing brown contents.
2. Cytolites	Elliptical, consisting in parenchymatous cells.
3. Cortex	Broad, several rows of sclerenchyma cells at outer side, stone cells visible.
4. Endodermis	Distinct.
5. Phloem	Relatively narrow, containing numerous phloem fibres.
6. Xylem	Broad, all of the cells lignified; vessels singly or 2~4 arranged radially; xylem rays broad.
7. Pith	Cells subrounded or polygonal, stone cells occasionally visible.

根茎横切面组织图注

1. 表皮	为数列细胞，内含棕色物。
2. 钟乳体	椭圆形，存在于薄壁细胞中。
3. 皮层	宽广，外侧为数列厚壁细胞，可见石细胞。
4. 内皮层	明显。
5. 韧皮部	较窄，韧皮纤维众多。
6. 木质部	宽广，细胞均木化；导管单个或2~4个径向排列；木射线宽广。
7. 髓	细胞类圆形或多角形，偶见石细胞。







100μm

Notes

1. Stone cells	Rectangular, subsquare or subtriangular, walls thickened with clear pit cananls and pits.
2. Cystolites	Pale yellow, sub-eliptical or scrotiform.
3. Fibres	Two types. Thick fibres: straight, walls relatively thick, lumina large, with clear pits and pit canals. Thin fibres: straight or curved, slender, walls thick and lumina linear.

图注

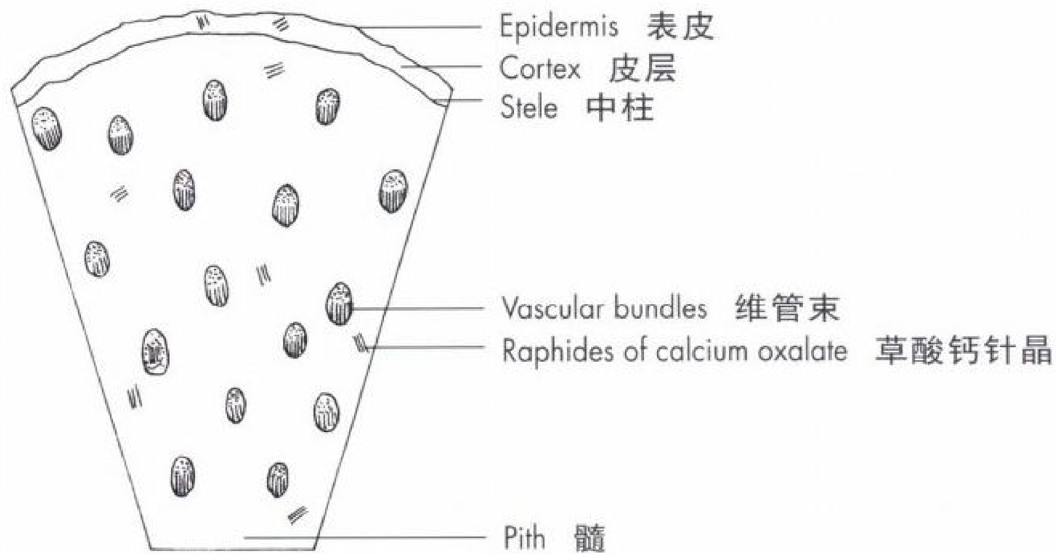
1. 石细胞	长方形、类方形或近三角形，壁厚，孔沟和纹孔清晰。
2. 钟乳体	淡黄色，近椭圆形或呈囊状。
3. 纤维	有粗细两种。粗纤维：平直，壁较厚，胞腔大，纹孔和孔沟明显。细纤维：平直或弯曲，细长，壁厚，胞腔线型。

天麻 Tianma

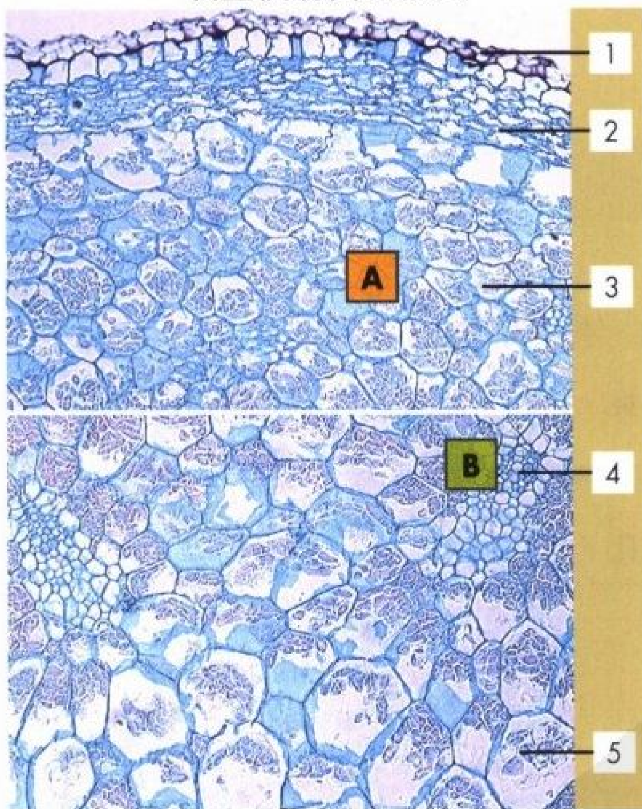


The dried tuber of *Gastrodia elata* Bl. (Fam. Orchidaceae).
兰科植物天麻的干燥块茎。

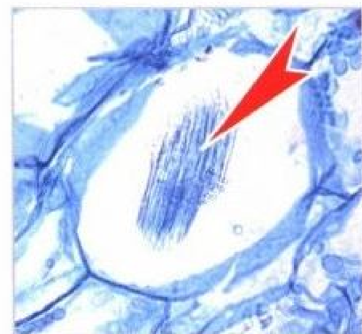
Sketch of transverse section of tuber
块茎横切面简图



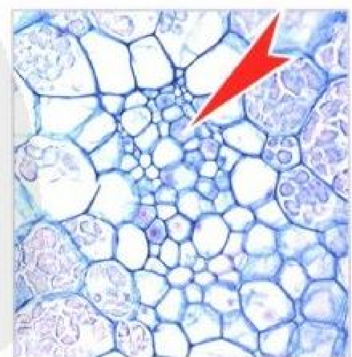
Transverse section of tuber
块茎横切面组织图



A *Parenchymatous cells containing raphides of calcium oxalate*
薄壁细胞含草酸钙针晶



B *Vascular bundle*
维管束



Transverse section of tuber

1. Epidermis	Residues of epidermis present.
2. Cortex	Over 10 rows of polygonal cells, some containing raphides of calcium oxalate.
3. Stele	Large, scattered with small vascular bundles, parenchymatous cells containing raphides of calcium oxalate.
4. Vascular Bundles	Collateral bundles or amphicribral vascular bundles scattered in stele.
5. Pith	Cells subrounded, with pits.

块茎横切面组织图注

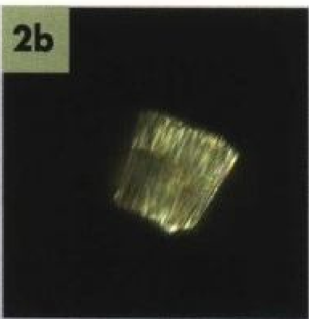
1. 表皮	完整或有时残留。
2. 皮层	10数列多角形细胞，有的含草酸钙针晶束。
3. 中柱	大，散列小型维管束，薄壁细胞含草酸钙针晶束。
4. 维管束	外韧型或周韧型维管束散在于中柱内。
5. 髓部	细胞类圆形，具纹孔。

Main Powder Characteristics
主要粉末显微特征









100μm

Notes

1. Sclerenchymatous cells	Elliptical or subpolygonal; 70~180μm in diameter, with walls 3~8μm thick and lignified.
2. Raphides of calcium oxalate	In bundles or scattered, 25~93μm long. Brightly yellowish-white in color observed under a polarizing microscope.
3. Parenchymatous cells containing gelatinized polysaccharides	Colorless, some containing long ovoid, long ellipsoid or subrounded granules; showing brown or pale brownish-purple color while adding iodine solution.

图注

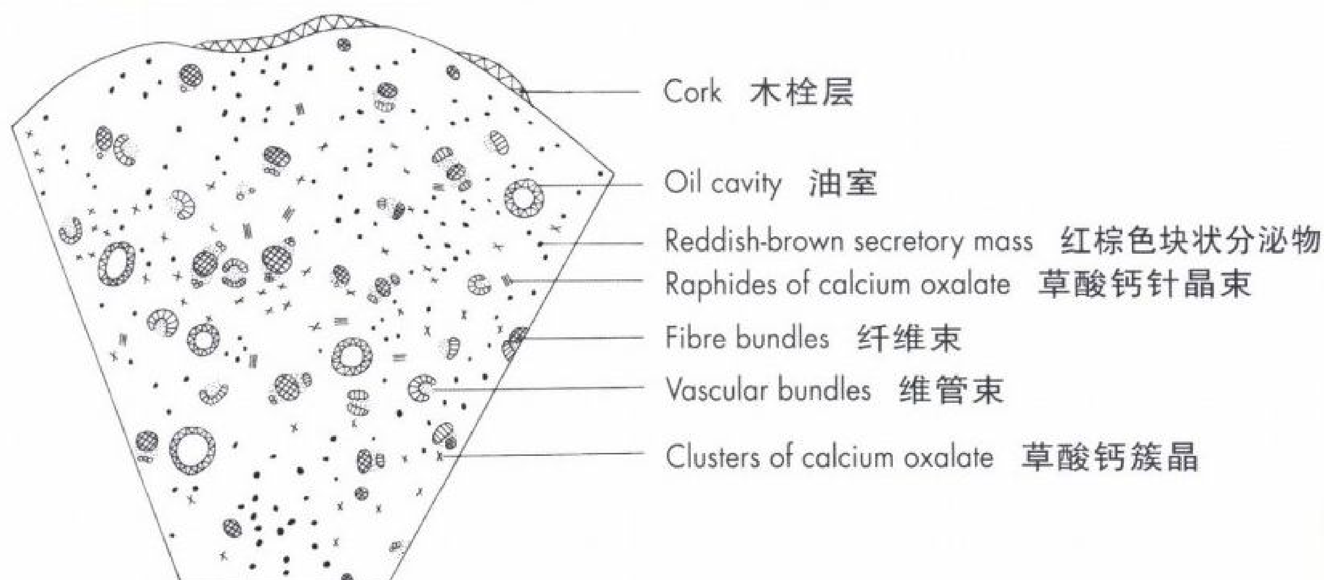
1. 厚壁细胞	椭圆形或类多角形，直径70~180μm，壁厚3~8μm，木化。
2. 草酸钙针晶	成束或散在，长25~93μm。偏光显微镜下呈亮黄白色。
3. 含糊化多糖类物的薄壁细胞	无色，有的细胞内可见长卵形、长椭圆形或类圆形颗粒，遇碘液显棕色或淡棕紫色。



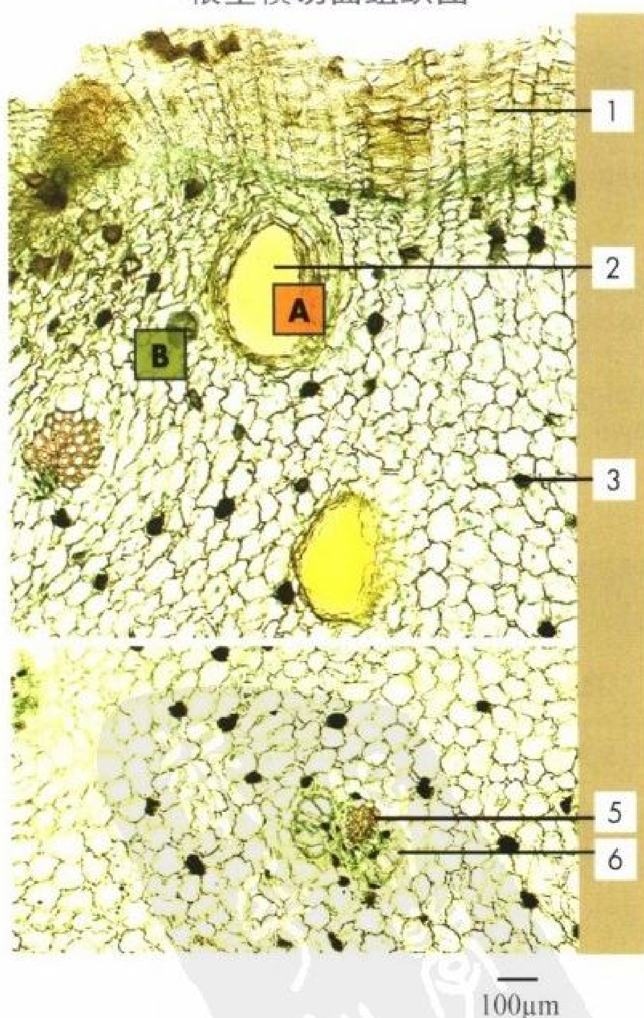
千年健 Qiannianjian

The dried rhizome of *Homalomena occulta* (Lour.) Schott (Fam. Araceae).
天南星科植物千年健的干燥根茎。

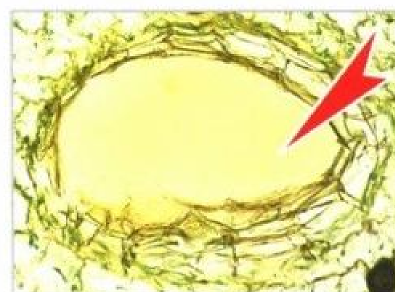
Sketch of transverse section of rhizome
根茎横切面简图



Transverse section of rhizome
根茎横切面组织图



A Oil cavity
油室



B Mucilage cells containing raphides of calcium oxalate
黏液细胞含有草酸钙针晶



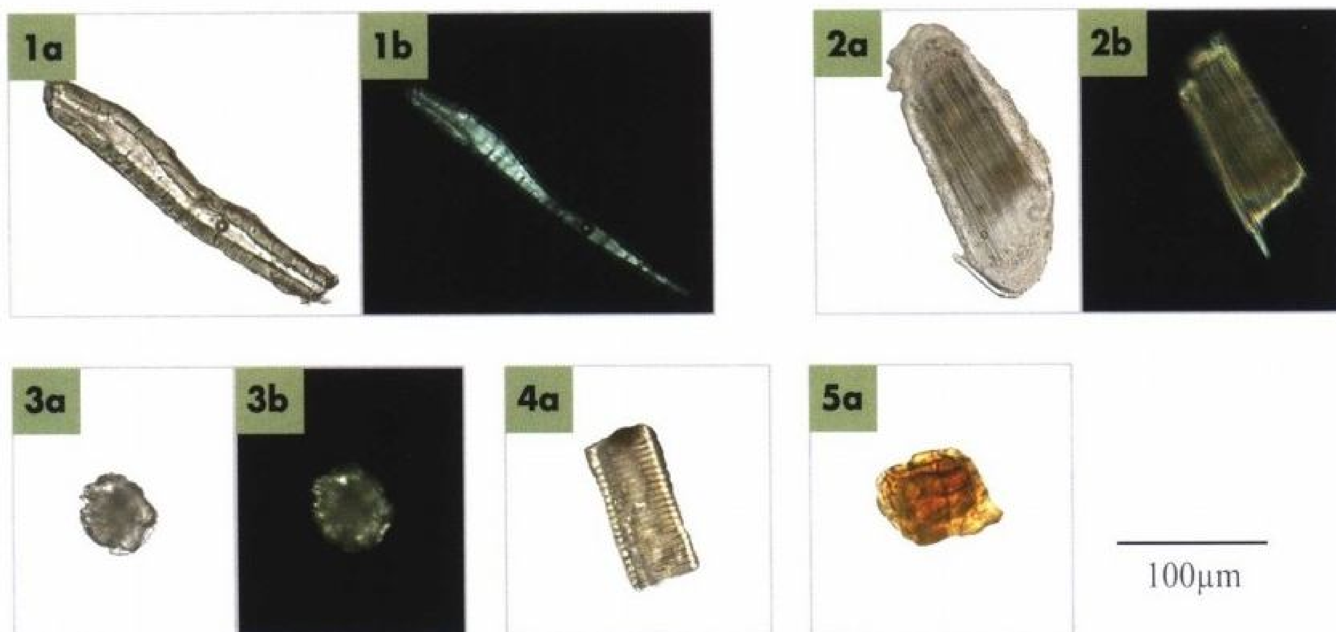
Transverse section of rhizome

1. Cork	Several rows of brown cork cells.
2. Oil cavities	Numerous and large, 180~375μm in diameter, surrounded by 4~5 layers of suberized secretory cells.
3. Reddish-brown secretory mass	Consisted in parenchymatous tissues. Showing dark green in color after stained.
4. Raphides of calcium oxalate	Consisted in mucilage cells.
5. Fibre bundles	Fibre walls thickened and lignified.
6. Vascular bundles	Collateral and amphivasal bundles, outside collateral bundles usually accompanied by fibre bundles.
Clusters of calcium oxalate	Scattered.

根茎横切面的组织图注

1. 木栓层	为数列棕色木栓细胞。
2. 油室	多，大型，直径180~375μm，周围有栓化的分泌细胞4~5层。
3. 红棕色块状分泌物	存在于基本组织中。染色后呈深绿色。
4. 草酸钙针晶束	存在于黏液细胞中。
5. 纤维束	壁较厚，木化。
6. 维管束	外韧型及周木型，外韧型维管束外侧常伴有纤维束。
草酸钙簇晶	散在。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Fibres	Frequently visible, in bundles or singly scattered, lignified, with scarce pits. Brightly yellowish-white in color observed under a polarizing microscope.
2. Raphides of calcium oxalate	Consisting in mucilage cells or scattered, 42~88μm long, brightly yellowish-green or polychromatic under a polarizing microscope.
3. Clusters of calcium oxalate	Scattered, 24~60μm in diameter. Brightly yellowish-green or polychromatic observed under a polarizing microscope.
4. Vessels	Mostly annular, scalariform vessels, 24~60μm in diameter. Brightly yellow or orange in color observed under a polarizing microscope.
5. Fragments of seretory cells	Pale yellow, suberized.

图注

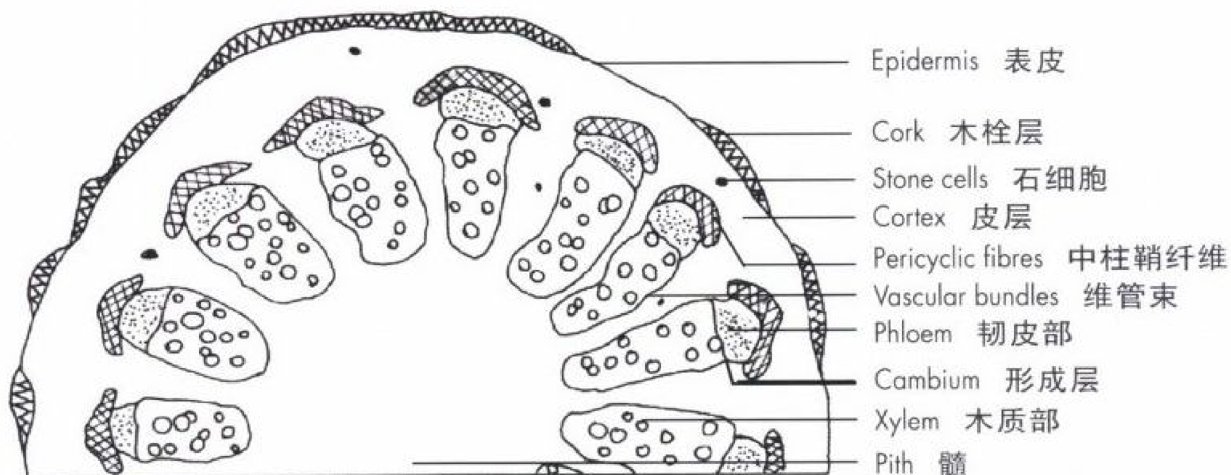
1. 纤维	多见，成束或单个散在，木化，有稀纹孔。偏光显微镜下呈亮黄白色。
2. 草酸钙针晶	存在于黏液细胞中或散在，长42~88μm，偏光显微镜下结晶呈亮黄绿色或多彩状。
3. 草酸钙簇晶	散在，直径24~60μm。偏光显微镜下结晶呈亮黄绿色间多彩状。
4. 导管	多为环纹、梯纹导管，直径24~60μm。偏光显微镜下导管呈亮黄色或橙黄色。
5. 分泌细胞碎片	浅黄色，木栓化。

北豆根 Beidougen

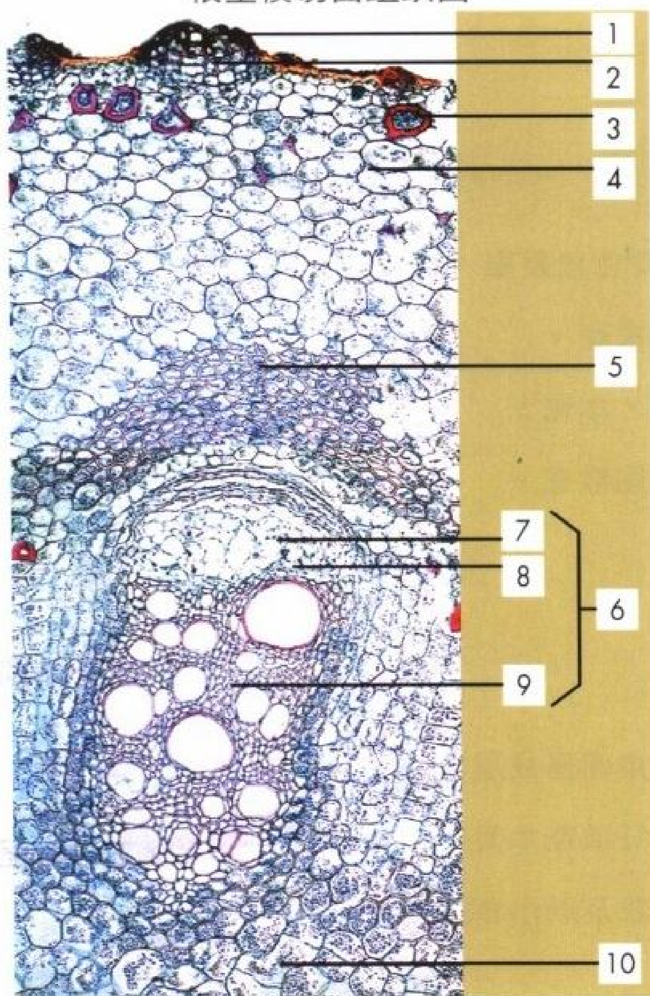


The dried rhizome of *Menispermum dauricum* DC. (Fam. Menispermaceae)
防己科植物蝙蝠葛的干燥根茎。

Sketch of transverse section of rhizome 根茎横切面简图



Transverse section of rhizome 根茎横切面组织图



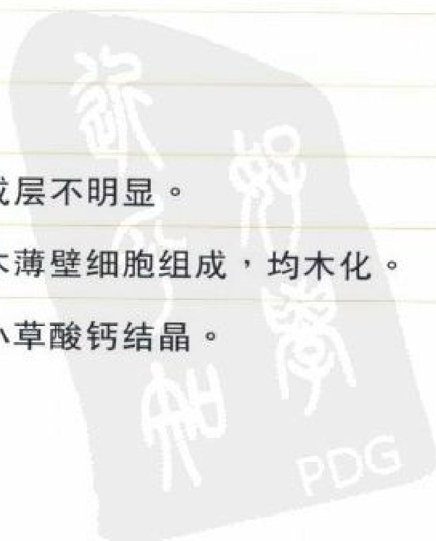


Transverse section of rhizome

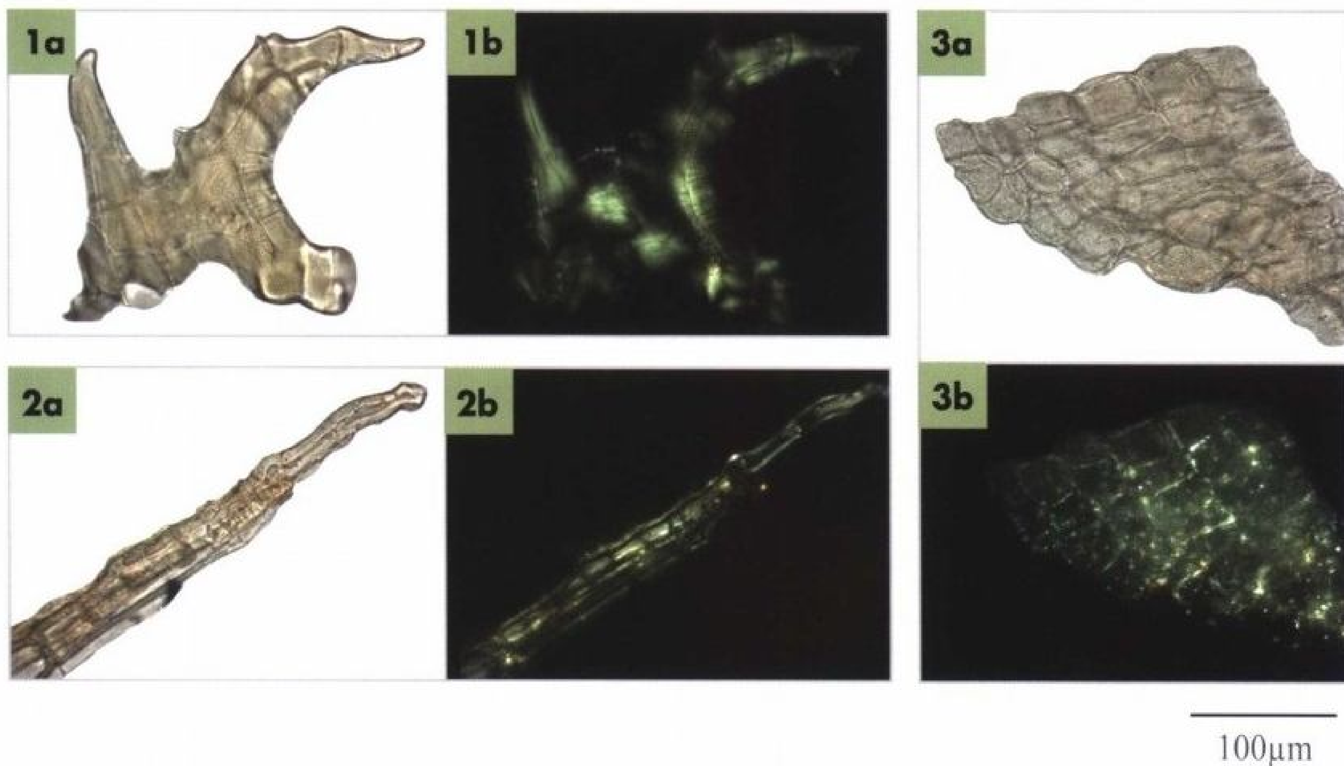
1. Epidermis	1 row of cells, covered with a brownish-yellow cuticle.
2. Cork	Consisting of several rows of cells, in an interrupted ring.
3. Stone cells	Subsquare or polygonal, lignified.
4. Cortex	Relatively broad, scattered with several stone cells.
5. Pericyclic fibres	Arranged in crescent shape.
6. Vascular bundles	Collateral type, arranged in a ring.
7. Phloem	With vascular bundles in the outer part.
8. Cambium	Fascicular cambium distinct, interfascicular cambium indistinct.
9. Xylem	Consisting of vessels, tracheids, xylem fibres, and xylem parenchymatous cells; all lignified.
10. Pith	Parenchymatous cells containing starch granules and fine crystals of calcium oxalate.

根茎横切面组织图注

1. 表皮	细胞1列，外被棕黄色角质层。
2. 木栓层	为数列细胞，断续成环。
3. 石细胞	呈类方形或多角形，木化。
4. 皮层	较宽，有单个石细胞散在。
5. 中柱鞘纤维	排列成新月形。
6. 维管束	外韧型，环列。
7. 韧皮部	外侧有纤维束。
8. 形成层	束中形成层明显，束间形成层不明显。
9. 木质部	由导管、管胞、木纤维及木薄壁细胞组成，均木化。
10. 髓部	薄壁细胞中含淀粉粒及细小草酸钙结晶。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Stone cells

Pale or fresh yellow; irregularly cladodromous, with 2~7 branches, seemingly several cells overlapped from the top view; the cellular lumina large, separated by 1~3 septa, containing brown or fine sandy crystals of calcium oxalates; also occurring few subcircular, rectangular or triangular stone cells. Yellowish-white in color observed under a polarizing microscope.

2. Phloem fibres

Pale yellow, long-fusiform in shape, tapering, blunt or truncate at the end; sometimes with septa; pits obliquely slit, V-shaped, or cruciform; the cellular lumina having sandy crystals of calcium oxalates. Yellowish-white in color observed under a polarizing microscope.

3. Crystals of calcium oxalates

Sandy crystals mainly present in cortex and ray cells, mostly being rod-shaped or pebbles-shaped. Square crystals few, square, rectangular or polygonal in shape. Visible under a polarizing microscope.

图注

1. 石细胞

淡黄色或鲜黄色。不规则分枝状，2~7分枝，顶面观似数个细胞重叠，胞腔较大，有的具1~3个横隔，内含棕色物或细小草酸钙砂晶。另有少数石细胞类圆形、类长方形或类三角形。偏光显微镜下呈黄白色。

2. 韧皮纤维

淡黄色。长梭形，末端渐尖、钝圆或平截，有时具分隔，纹孔斜裂缝状、人字状或十字状，胞腔内有的含草酸钙砂晶。偏光显微镜下呈黄白色。

3. 草酸钙结晶

砂晶主要存在于皮层细胞及射线细胞中，大多呈棒状或砂粒状。方晶少数，呈方形、长方形或多边形。偏光显微镜下可见。

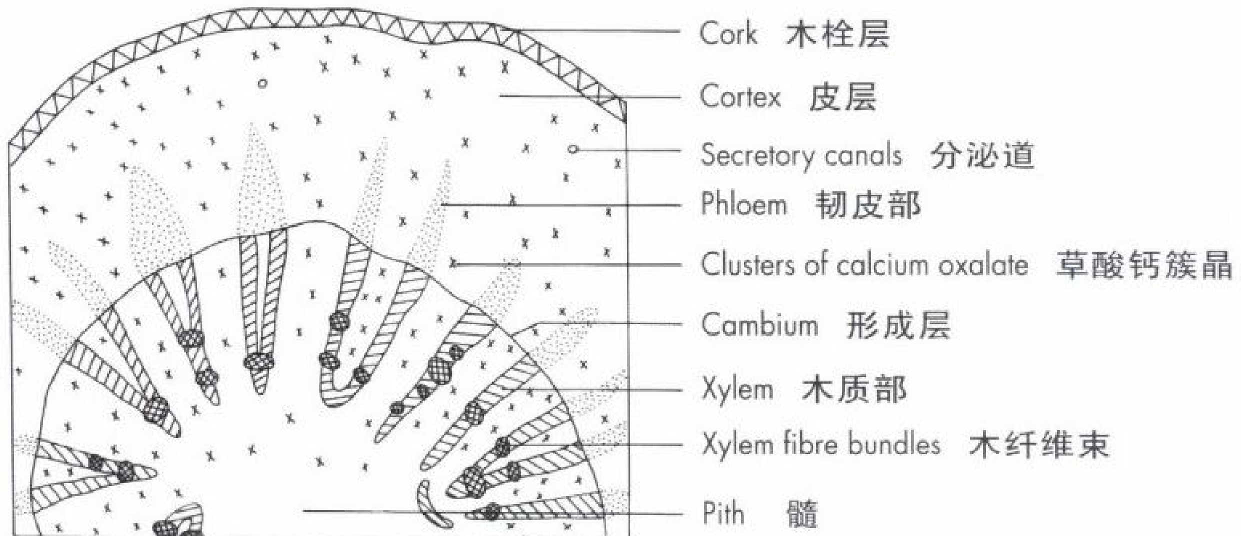


竹节参 Zhujieshen

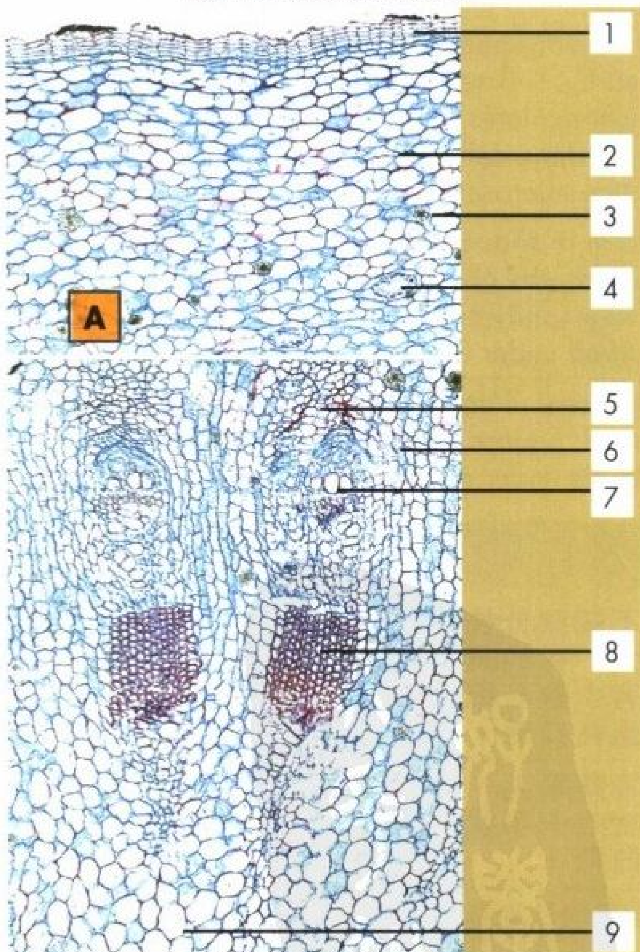
The dried rhizome of *Panax japonicus* C. A. Mey. (Fam. Araliaceae).

五加科植物竹节参的干燥根茎。

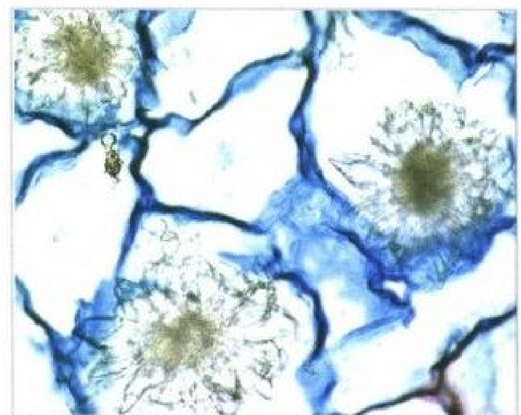
Sketch of transverse section of rhizome
根茎横切面简图



Transverse section of rhizome
根茎横切面组织图



A Clusters of calcium oxalate
草酸钙簇晶



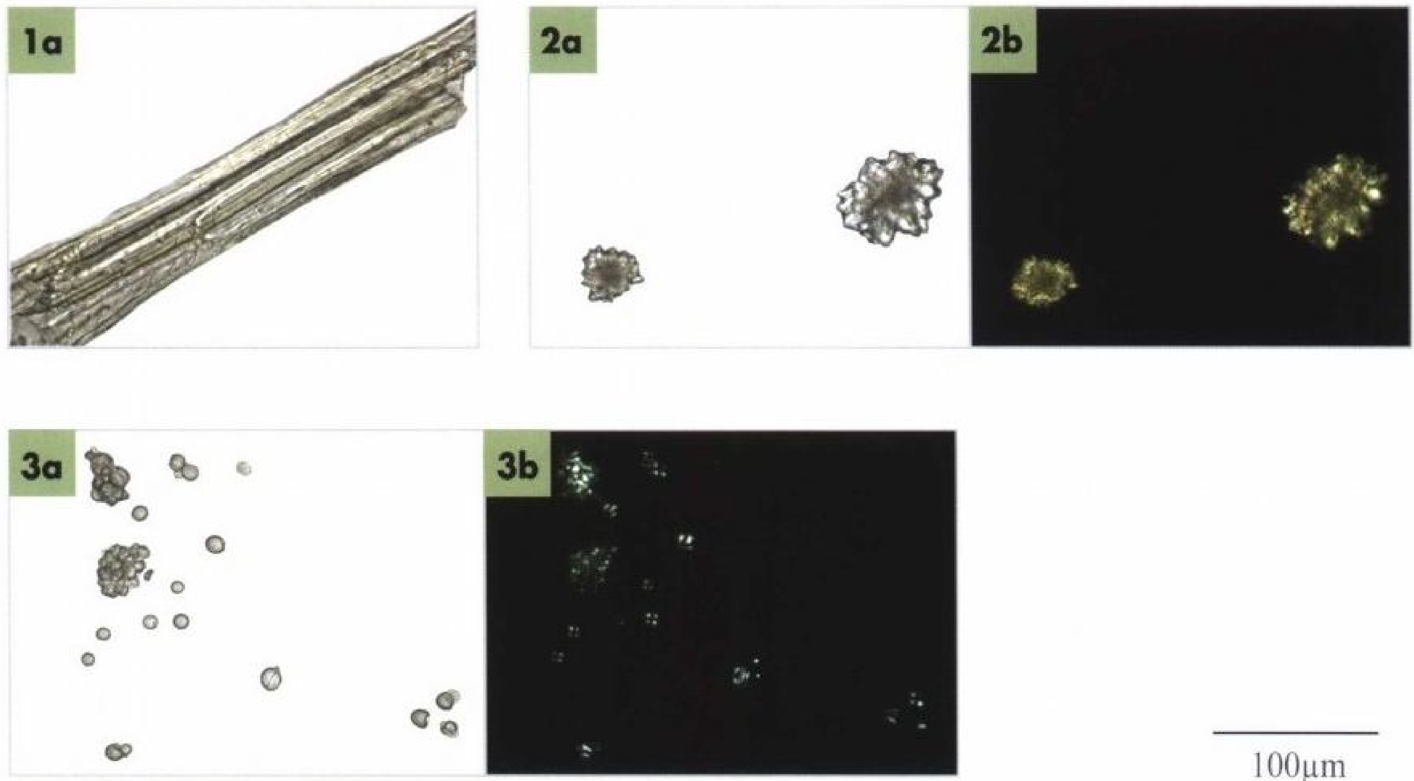
Transverse section of rhizome

1. Cork	Consisting of 2~10 rows of cells.
2. Cortex	Slightly broad.
3. Clusters of calcium oxalate	Relatively numerous, scattered in parenchymatous cells, 17~70μm in diameter.
4. Secretory canals	Cortex with less secretory canals, phloem occasionally visible.
5. Phloem	Secretory canals observed occasionally.
6. Cambium	In a ring.
7. Xylem bundles	Almost in 2~4 strands arranged radially, sometimes arranged in a row.
8. Xylem fibres	Usually in 1~4 strands, some fibre bundles accompanied by larger and lignified sclerenchymatous cells.
9. Pith	Relatively broad.

根茎横切面组织图注

1. 木栓层	为2~10列细胞。
2. 皮层	稍宽。
3. 草酸钙簇晶	较多，分布于薄壁细胞中，直径17~70μm。
4. 分泌道	皮层有少数分泌道，韧皮部偶见。
5. 韧皮部	偶见分泌道。
6. 形成层	成环。
7. 木质部束	略做2~4股性放射状排列，也有呈单行排列。
8. 木纤维	常1~4束，有的纤维束旁有较大的木化厚壁细胞。
9. 髓	较宽广。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Xylem fibres	Scattered or in bundles, about 25μm in diameter, with slightly thickened walls, pits oblique cleft, some crossed to form V-shape.
2. Clusters of calcium oxalate	15~70μm in diameter. Polychrome observed under a polarizing microscope.
3. Starch granules	Numerous, simple granules subrounded, about 10μm in diameter, compound granules mostly composed of 2~8 components. Black, cruciate shape observed under a polarizing microscope.

图注

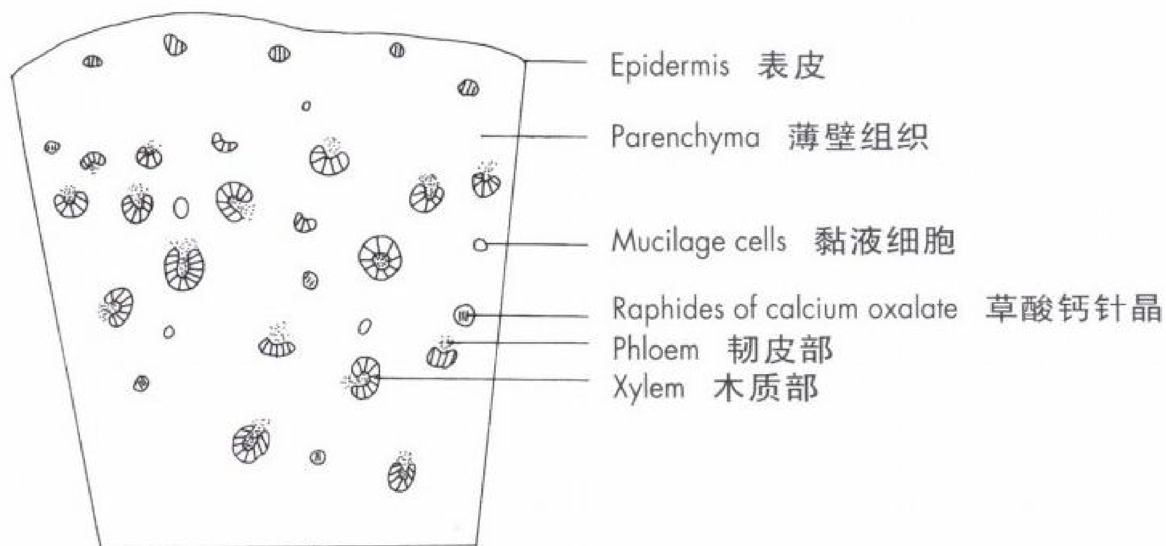
1. 木纤维	散在或成束，直径约25μm，壁稍厚，纹孔斜裂缝状，有的交叉呈人字状。
2. 草酸钙簇晶	直径15~70μm。偏光显微镜下结晶呈多彩状。
3. 淀粉粒	众多，单粒，呈类圆形，直径约10μm。复粒淀粉粒多由2~8分粒组成。偏光显微镜下呈黑十字状。

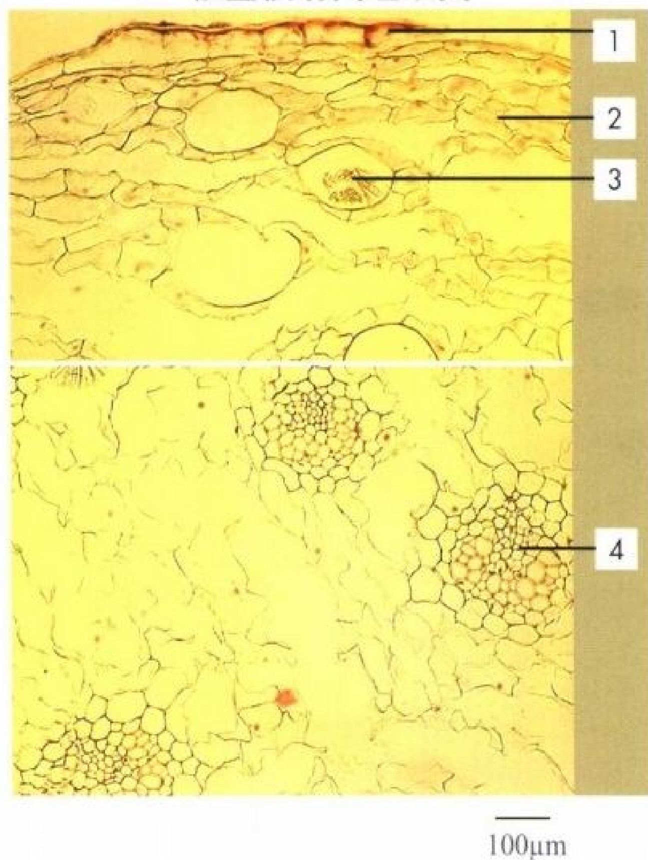
黄精 Huangjing



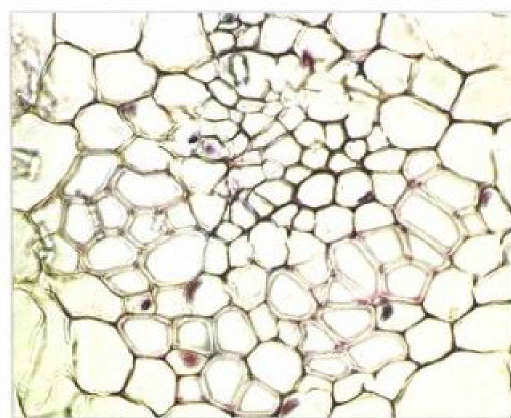
The dried rhizome of *Polygonatum sibiricum* Red. (Fam. Liliaceae).
百合科植物黄精的干燥根茎。

Sketch of transverse section of rhizome
根茎横切面简图





Transverse section of rhizome
根茎横切面组织图



A Collateral vascular bundle
外韧型维管束

Transverse section of rhizome

1. Epidermis	External walls of cells relatively thick.
2. Parenchyma	Scattered with numerous large mucilage cells.
3. Micilaginous cells	Containing raphides of calcium oxalate.
4. Vascular bundles	Scattered, mainly collateral type.

根茎横切面组织图注

1. 表皮	细胞外壁较厚。
2. 薄壁组织	散有多数大的黏液细胞。
3. 黏液细胞	内含草酸钙针晶束。
4. 维管束	散列，大多为外韧型。

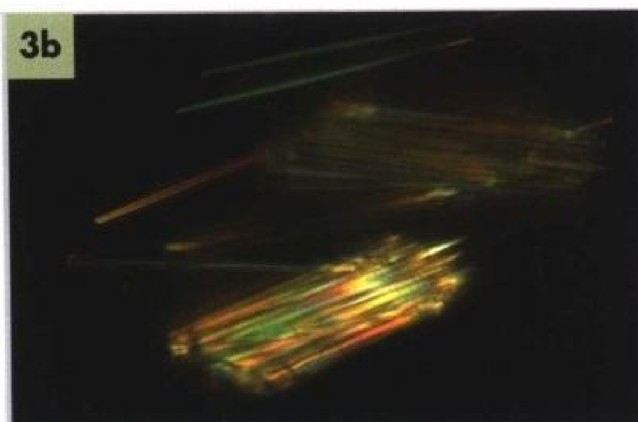


Main Powder Characteristics
主要粉末显微特征









100μm

Notes

1. Epidermal cells	Anticlinal walls slightly thickened amd undulantly curved; stomata subrounded.
2. Vessels	Reticulate or scalariform vessels.
3. Raphides of calcium oxalate	Mostly in bundles or singly scattered. Bright orange with polychrome in color observed under a polarizintg microscope.

图注

1. 表皮细胞	垂周壁稍增厚，略波状弯曲。气孔类圆形。
2. 导管	网纹或梯纹导管。
3. 草酸钙针晶	多成束或单个散在。偏光显微镜下呈亮橙黄色间多彩色。

Rhizoma Polygonati Odorati

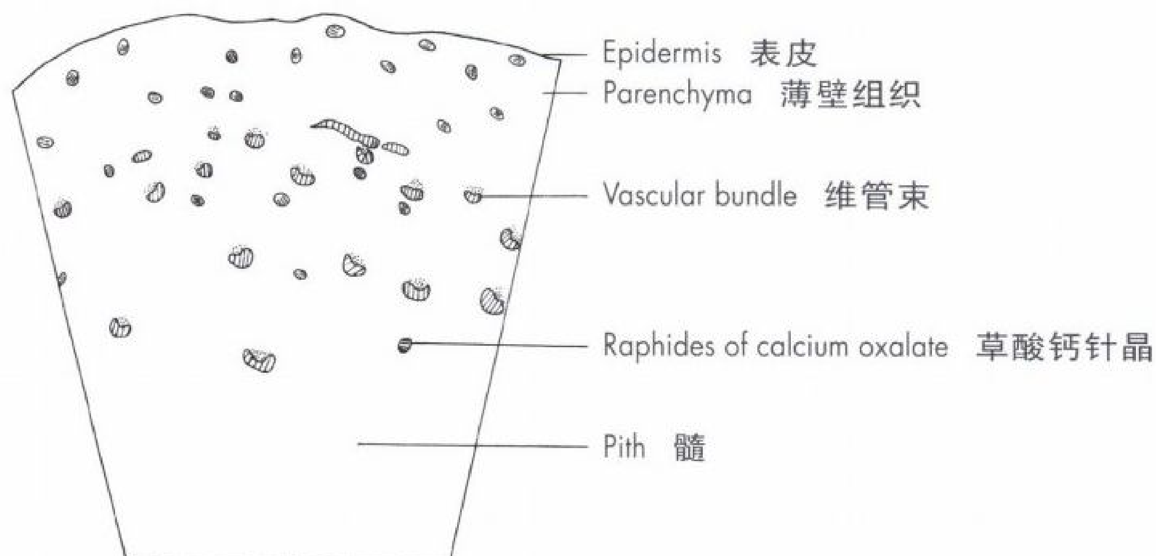
玉竹 Yuzhu



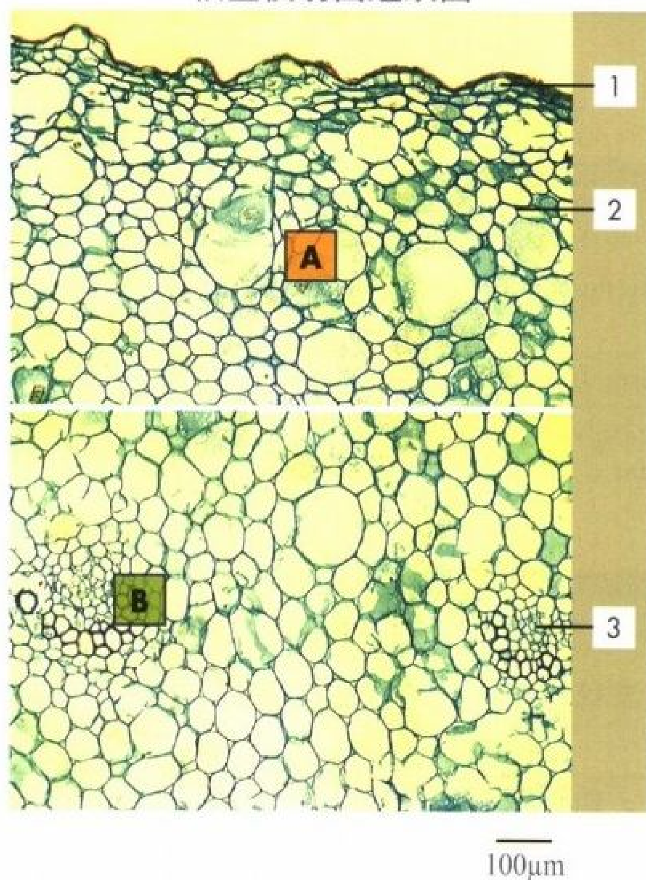
The dried rhizome of *Polygonatum odoratum* (Mill.) Druce (Fam. Liliaceae).

百合科植物玉竹的干燥根茎。

Sketch of transverse section of rhizome
根茎横切面组织简图

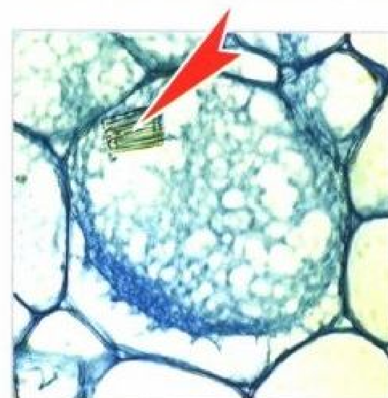


Transverse section of rhizoma
根茎横切面组织图



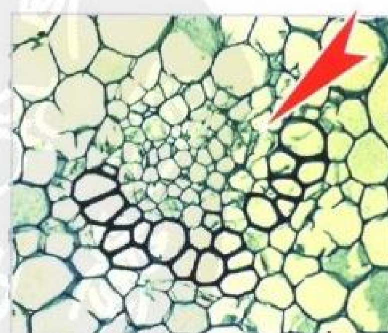
100μm

A ***Mucilage cells containing raphides of calcium oxalate***
黏液细胞含有草酸钙针晶



50μm

B ***Vascular bundle***
维管束



50μm

Transverse section of rhizome

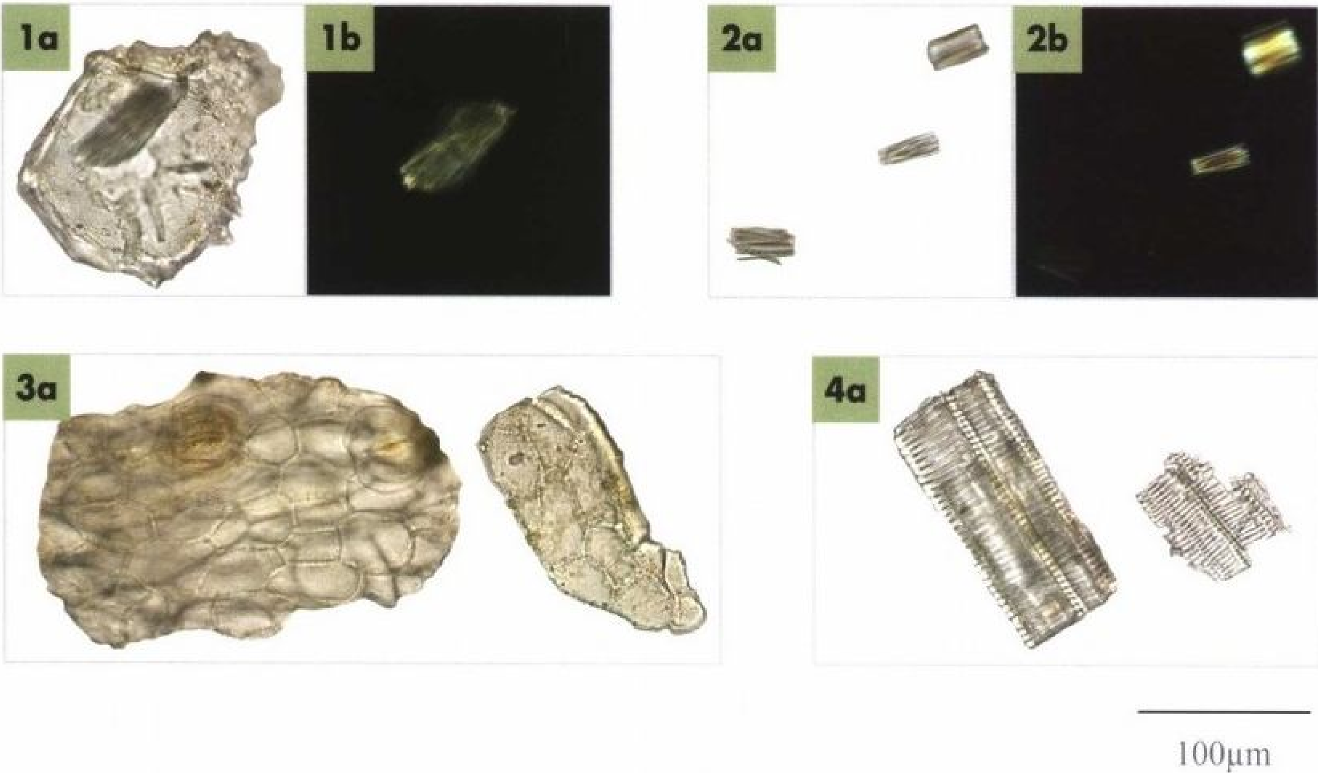
1. Epidermis	Cells oblate or compressed-rectangular, outer walls slightly thickened, horny.
2. Parenchyma	Numerous mucilage cells scattered throughout parenchyma, containing raphides of calcium oxalate.
3. Vascular bundles	Collateral bundles, scattered with few amphivasal bundles.

根茎横切面组织图注

1. 表皮	细胞扁圆形或扁长方形，外壁稍厚，角质化。
2. 薄壁组织	其中散有多数黏液细胞，内含草酸钙针晶束。
3. 维管束	外韧型，稀有周木型散在。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Mucilage cells	Above 110μm in diameter, containing mucus and raphids of calcium oxalate.
2. Raphides of calcium oxalate	In bundles, present in mucilage cells or scattered, 25~135μm long, 1~4μm in diameter. Brightly orange in color observed under a polarizing microscope.
3. Epidermal cells	On the surface view: anticlinal walls undulantly curved, thickened like a line of bead, stomata anomocytic. In the lateral view: 1 row of epidermal cells, covered with cuticle.
4. Vessels	Scalariform, reticulate and bordered pitted vessels.

图注

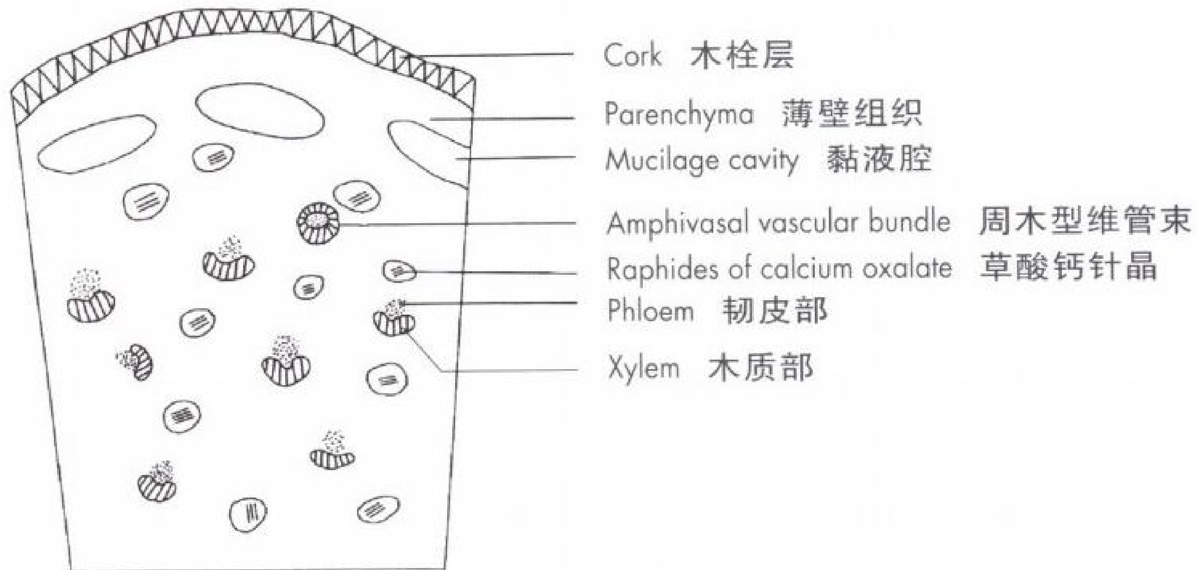
1. 黏液细胞	直径110μm以上，内含黏液及草酸钙针晶束。
2. 草酸钙针晶	成束存在于黏液细胞中或散在，长25~135μm，直径1~4μm。偏光显微镜下呈亮橙黄色。
3. 表皮细胞	表面观垂周壁波状弯曲，连珠状增厚，气孔不定式；侧面观表皮细胞1列，外被角质层。
4. 导管	为梯纹、网纹及具缘纹孔导管。



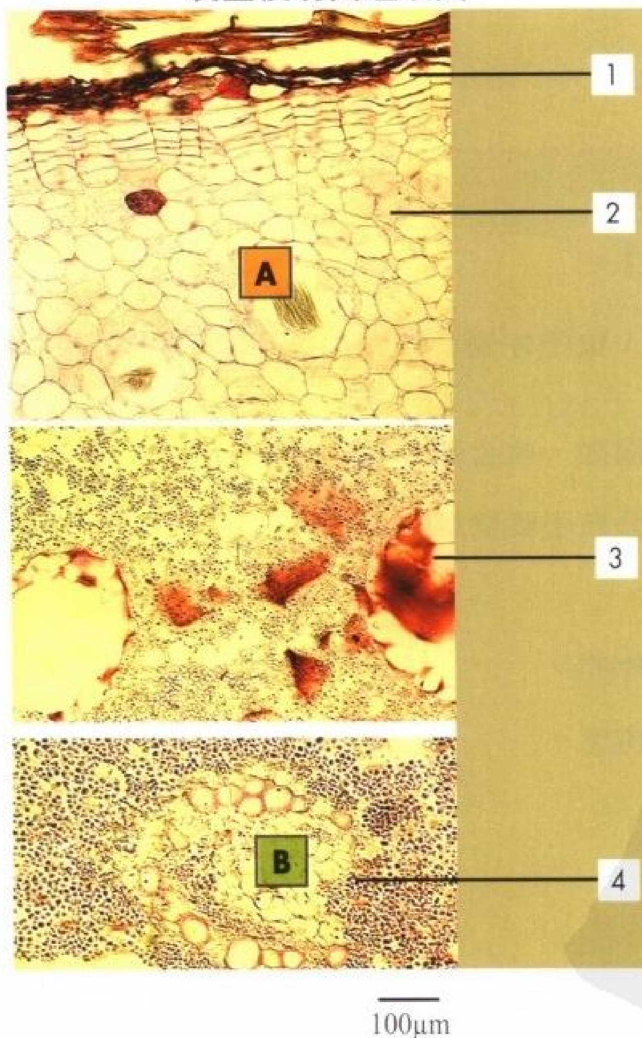
白附子 Baifuzi

The dried tuber of *Typhonium giganteum* Engl. (Fam. Araceae).
天南星科植物独角莲的干燥块茎。

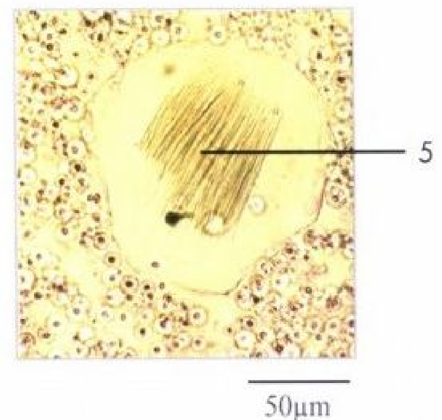
Sketch of transverse section of tuber
块茎横切面简图



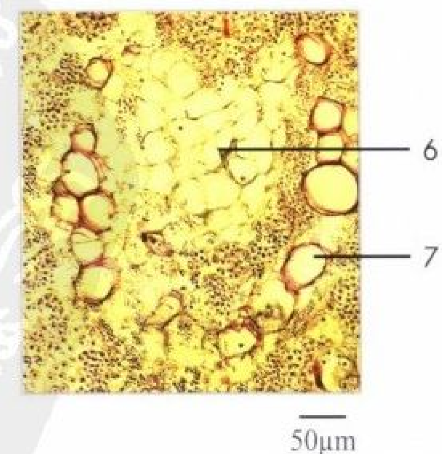
Transverse section of tuber
块茎横切面组织图



A Raphides of calcium oxalate
草酸钙针晶



B Amphivasal vascular bundle
周木型维管束



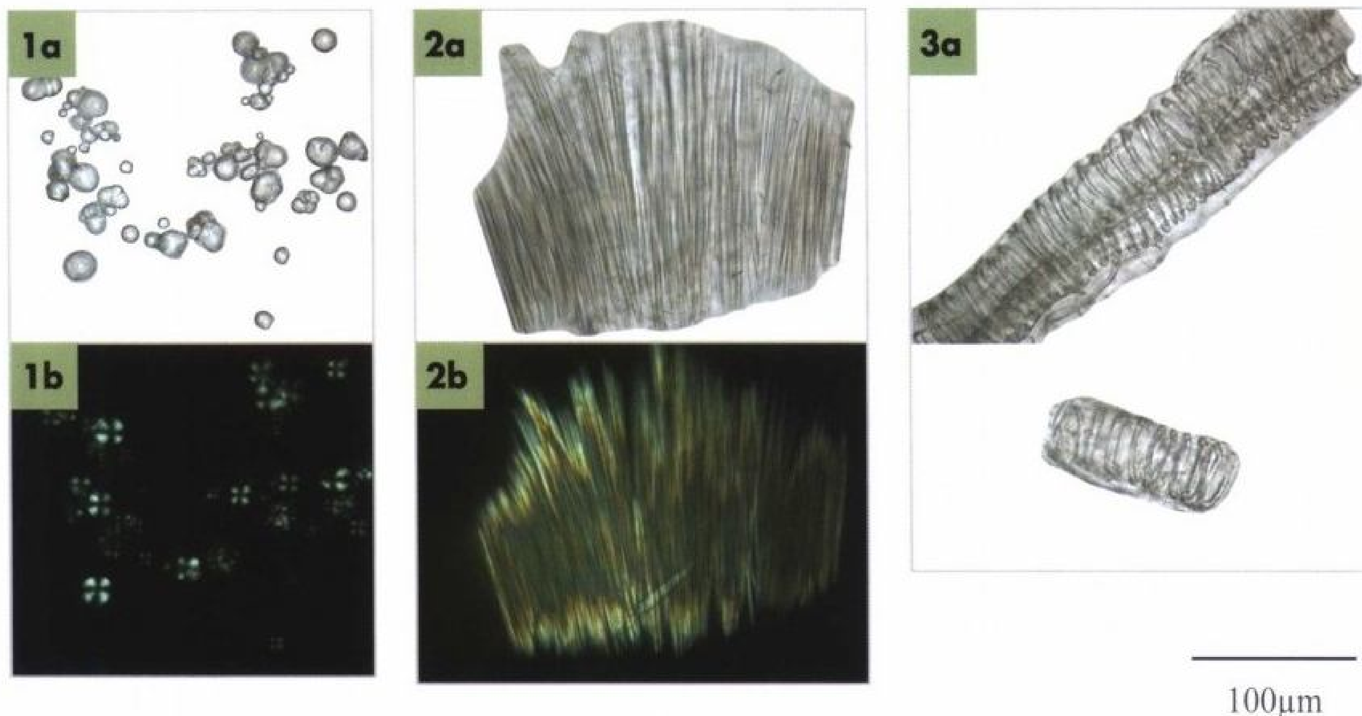
Transverse section of tuber

1. Cork	Several rows of cells and fragmental.
2. Parenchyma	Numerous mucilage cavities scattered, relatively large in the outer part, usually arranged in the form of ring, gradually becoming small and rare towards the center.
3. Mucilage cavities	Elliptical or subrounded, containing raphides of calcium oxalate.
4. Vascular bundles	Amphivasal or collateral type, freely distributed in the parenchymatous cells.
5. Raphides of calcium oxalate	Located in the mucilage cells.
6. Phloem	In the central or outter part of vascular bundle.
7. Xylem	In the peripheric or inner part of vascular bundle.

块茎横切面组织图注

1. 木栓层	细胞数列，碎片状。
2. 薄壁组织	有众多黏液腔散在，位于外侧者较大，常环状排列，向中心渐小而少。
3. 黏液腔	大型，椭圆形或类圆形，内含草酸钙针晶束。
4. 维管束	周木型或外韧型，分布于薄壁细胞中。
5. 草酸钙针晶	存在于黏液细胞中。
6. 韧皮部	位于维管束中央或外侧。
7. 木质部	位于维管束四周或内侧。

Main Powder Characteristics
主要粉末显微特征



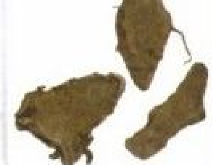
Notes

1. Starch granules	Numerous; simple granules globular or subspherical, 2~29μm in diameter; hilum dotted, slit-shaped or V-shaped. Compound granules composed of 2~4 compontents commonly seen. Black, cruciate shape observed under a polarizing microscope.
2. Raphides of calcium oxalate	Scattered or in bundles located in mucilage cells, to 97μm long. Brightly orange alternated by polychrome observed under a polarizing microscope.
3. Vessels	Spiral, annular vessals scattered, 9~45μm in diameter.

图注

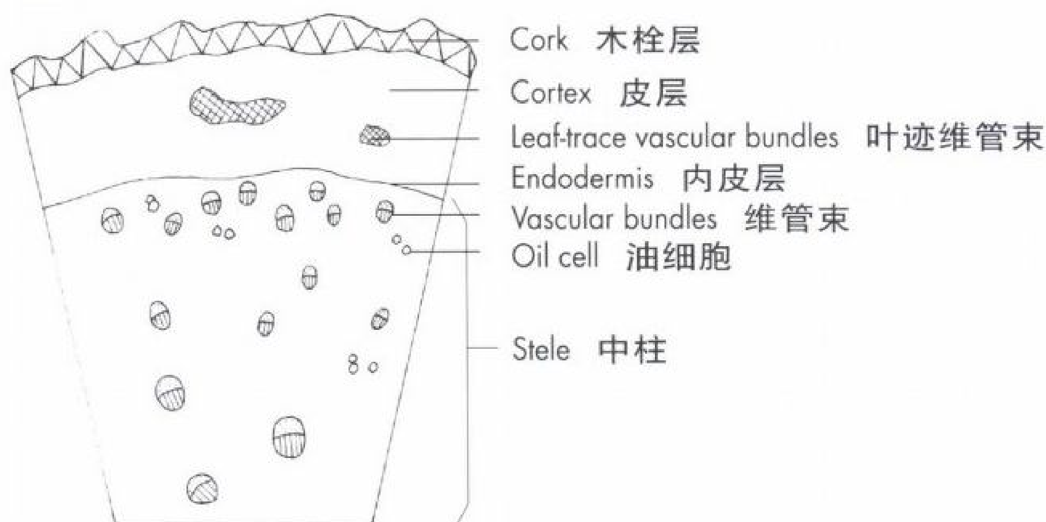
1. 淀粉粒	甚多，单粒球形或类球形，直径2~29μm，脐点点状、裂缝状或人字状；复粒由2~4分粒者多见。偏光显微镜下呈黑十字状。
2. 草酸钙针晶	散在或成束存在于黏液细胞中，针晶长至97μm。偏光显微镜下结晶呈亮橙黄色间多彩状。
3. 导管	螺纹、环纹导管散在，直径9~45μm。

片姜黄 Pianjianghuang

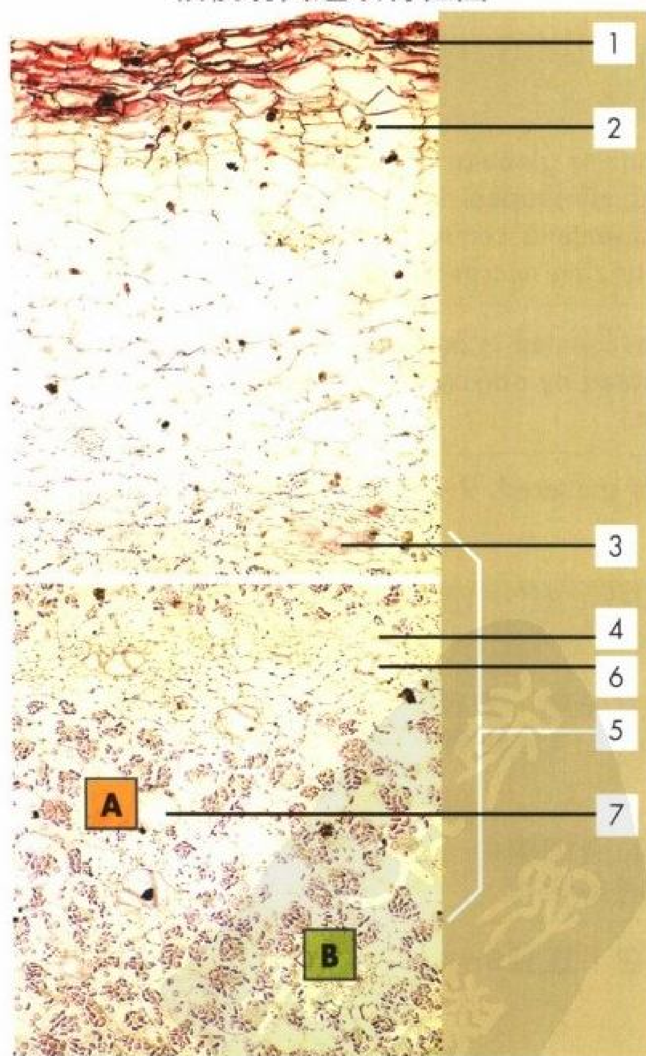


The dried rhizome of *Curcuma wenyujin* Y. H. Chen et C. Ling (Fam. Zingiberaceae).
姜科植物温郁金的干燥根茎。

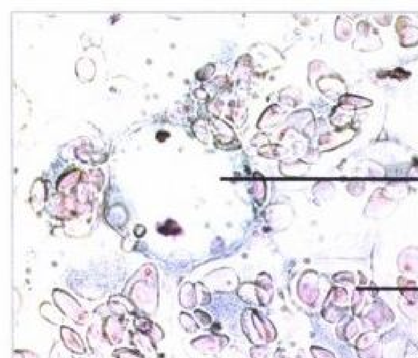
Sketch of transverse section of rhizome
根横切面简图



Transverse section of rhizome
根横切面组织特征图



A *Oil cells and starch granules*
油细胞和淀粉粒



B *Vascular bundle*
维管束



Transverse section of rhizome

1. Cork	More layers of cells, cell walls suberized.
2. Cortex	Scattered with leaf-trace vascular bundles in the parenchymatous cells.
3. Leaf-trace vascular bundles	Scattered.
4. Endodermis	Small cells, Casparian dots distinct.
5. Stele	Large.
6. Vascular bundles	Collateral bundles, relatively small outside and arranged densely, some xylem with 1~2 vessels only, the centre of stele relatively large, and accompanied by thin-walled fibres.
7. Oil cells	Scattered in cortex and stele parenchymatous tissue.

根茎横切面组织图注

1. 木栓层	细胞多列，细胞壁木栓化。
2. 皮层	薄壁细胞中散有叶迹维管束。
3. 叶迹维管束	散在。
4. 内皮层	细胞小，凯氏点明显。
5. 中柱	大。
6. 维管束	外韧型，靠外侧的较小，排列紧密，有的木质部仅1 ~ 2个导管，中间较大，并伴有薄壁纤维。
7. 油细胞	散在于皮层及中柱薄壁组织中。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Numerous, orbicular-ovate, elliptical or short-stipitiform, 20~40μm long, 11~24μm in diameter, hilum usually eccentric at the angustate end, striation visible. Black, off-center cruciate shape was observed under a polarizing microscope.
2. Vessels	Spiral, scalariform, 13~53μm in diameter.
3. Fibers	Mostly broken, 15~34μm in diameter, wall thickened and lignified, pit canal distinct. Showing bright blueish-white in color under a polarizing microscope.
4. Oil cells	Usually with yellowish-brown secretions.
5. Non-glandular hair	Mostly broken into fragments.

图注

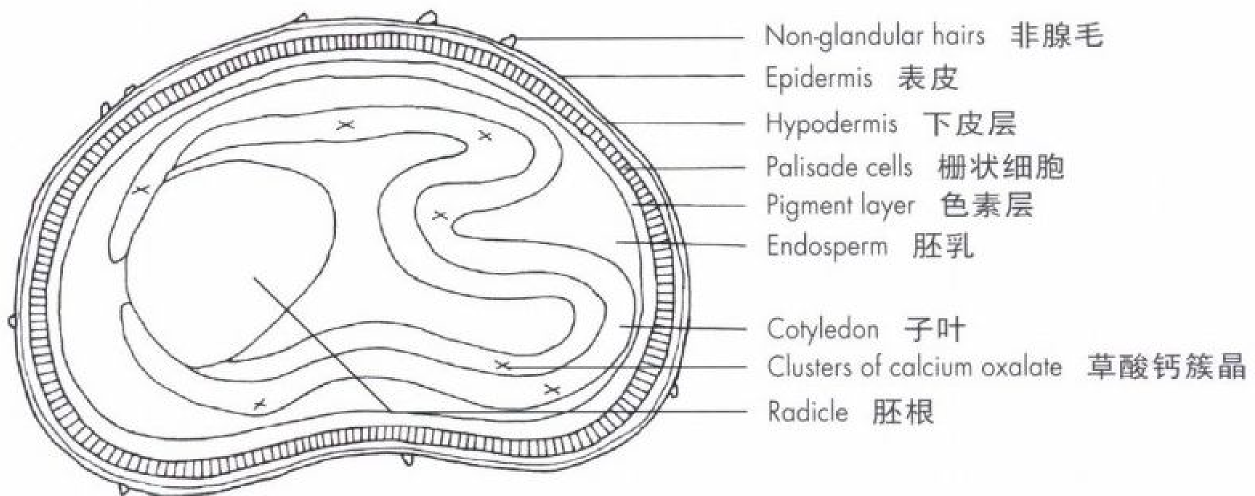
1. 淀粉粒	众多，呈卵圆形、椭圆形或短杆形，长20 ~ 40μm，直径11 ~ 24μm，脐点多偏心性，位于较狭的一端，可见层纹。偏光下呈偏心黑十字。
2. 导管	为螺纹、梯纹，直径为13 ~ 53μm。
3. 纤维	多端碎，直径15 ~ 34μm，壁厚，木化，孔沟明显。偏光下呈亮蓝白色。
4. 油细胞	多含黄棕色分泌物。
5. 非腺毛	多已成碎片。



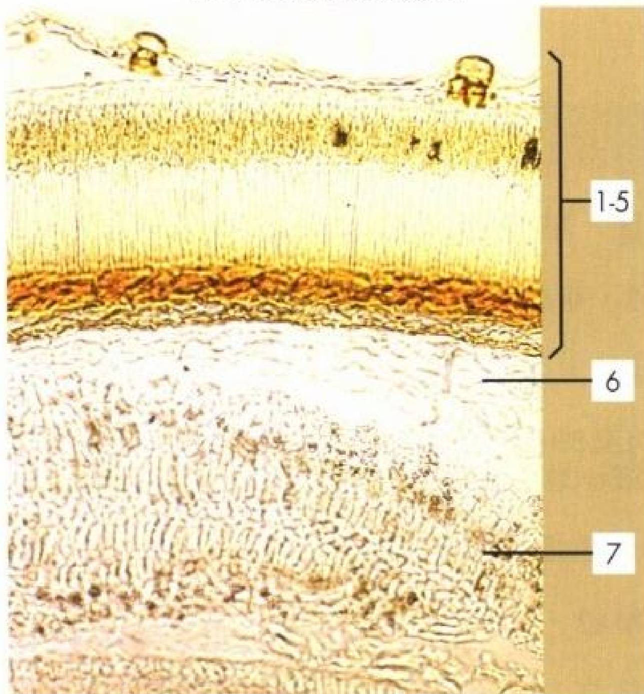
苘麻子 Qingmazi

The dried ripe seed of *Abutilon theophrastii* Medic. (Fam. Malvaceae).
锦葵科植物苘麻的干燥成熟种子。

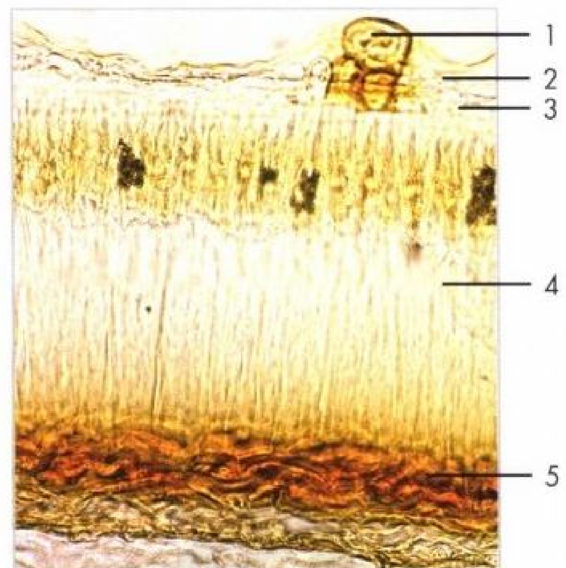
Sketch of transverse section of seed
种子横切面组织简图



Transverse section of seed
种子横切面组织图



A *From epidermis to pigment layer*
表皮~色素层



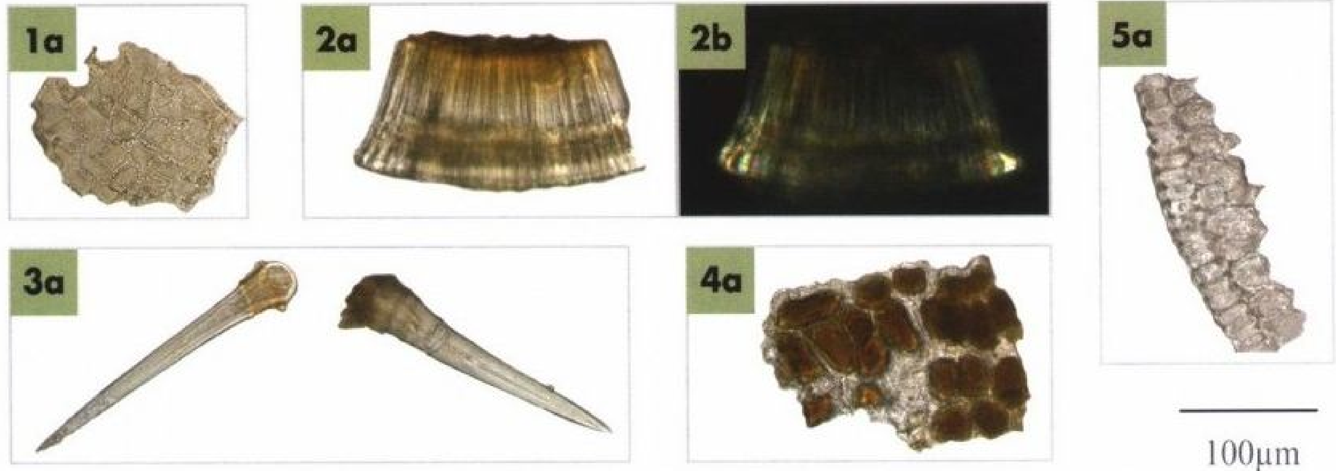
Transverse section of seed

1. Non-glandular hairs	Unicellular, apical end sharp or round, thichened walls.
2. Epidermis	1 row of cells, flattened-rectangular, some of them differentiated to form unicellular non-glandular hairs.
3. Hypodermis	Cells 1 row, slightly radially extended.
4. Palisade cells	1 row, long cylindrical, about up to 88μm long, very thickened walls, linear lumina visible at the upper part, and the terminal end expanded, containing small globular crystals.
5. Pigment layer	Consisting of 4~5 rows of cells, containing yellowish-brown or reddish-brown contents.
6. Endosperm	Cells containing fatty oil droplets and aleurone grains.
7. Cotyledons	Cells containing fatty oil droplets and aleurone grains, and containing few fine clusters of calcium oxalate.

种子横切面组织图注

1. 非腺毛	单细胞，先端尖或圆，壁厚。
2. 表皮	细胞1列，扁长方形，有的分化成单细胞非腺毛。
3. 下皮层	细胞1列，略径向延长。
4. 栅栏细胞	1列，长柱形，长约至88μm，壁极厚，上部可见线形胞腔，其末端膨大，内含细小球状结晶。
5. 色素层	4～5列细胞，含黄棕色或红棕色物。
6. 胚乳	细胞含脂肪油和糊粉粒。
7. 子叶	细胞含脂肪油和糊粉粒，并含少数细小草酸钙簇晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Endosperm cells	Clear, present in groups, polygonal or subsquare in shape, 13~25μm in diameter, the walls unevenly thickened showing chain-form, the middle lamella indistinct occasionally.
2. Palisade cells of testa	One row of columnar cells in the lateral view, mainly present in bundle, 68~100μm long, 12~15μm in diameter, the cells with the slightly lignified and thick walls, the cellular lumina narrowed to stellate form located to one side, the cellular boundaries unclear on the surface view. Visible under a polarizing microscope.
3. Unicellular non-gland hairs	Easily seen, mainly pale yellow, long cone or lanceolate in shape, the tips pointed sharp while the bases enlarged, 43~213μm in length, 28~45μm in diameter, the walls quite thick and cellular lumina containing reddish-brown contents.
4. Pigment cells	Subsquare or subrectangular, the cellular boundaries sometimes obscure, the cellular lumina containing reddish-brown masses.
5. Cotyledonous epidermal cells	Small, polygonal, parenchymatous cells subpolygonal, long-polygonal or elliptical in shape, the cellular lumina containing fatty oil droplets and aleurone grains.

图注

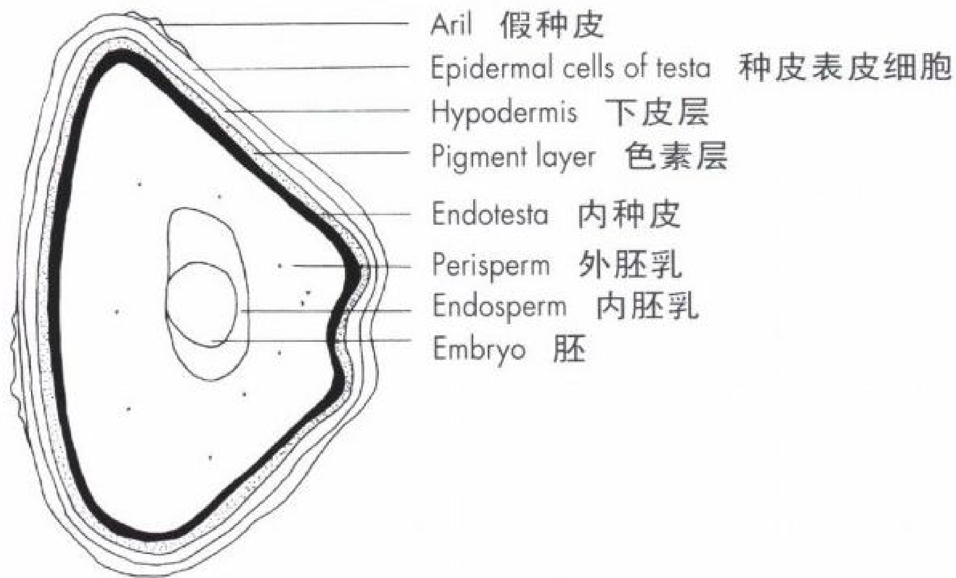
1. 胚乳细胞	易见，成片，呈多角形或类方形，直径13~25μm，壁不均匀增厚，略呈链条状，中层壁有时不明显。
2. 种皮栅状细胞	侧面观为一列柱状细胞，多成束存在，长68~100μm，直径12~15μm，壁甚厚，微木化，胞腔多偏向于一侧；表面观细胞界限不明显，胞腔狭窄如星状，偏光下可见。
3. 单细胞非腺毛	易见，多淡黄色，呈长锥形或长披针形，尾端尖锐，基部膨大，长43~213μm，直径28~45μm，壁较厚，胞腔内多含红棕色物。
4. 色素细胞	类方形或近长方形，界限有时不清，胞腔内含红棕色块状物。
5. 子叶表皮细胞	较小，呈多角形，薄壁细胞呈类多角形、长多角形或椭圆形，胞腔内含脂肪油及糊粉粒。

草豆蔻 Caodoukou

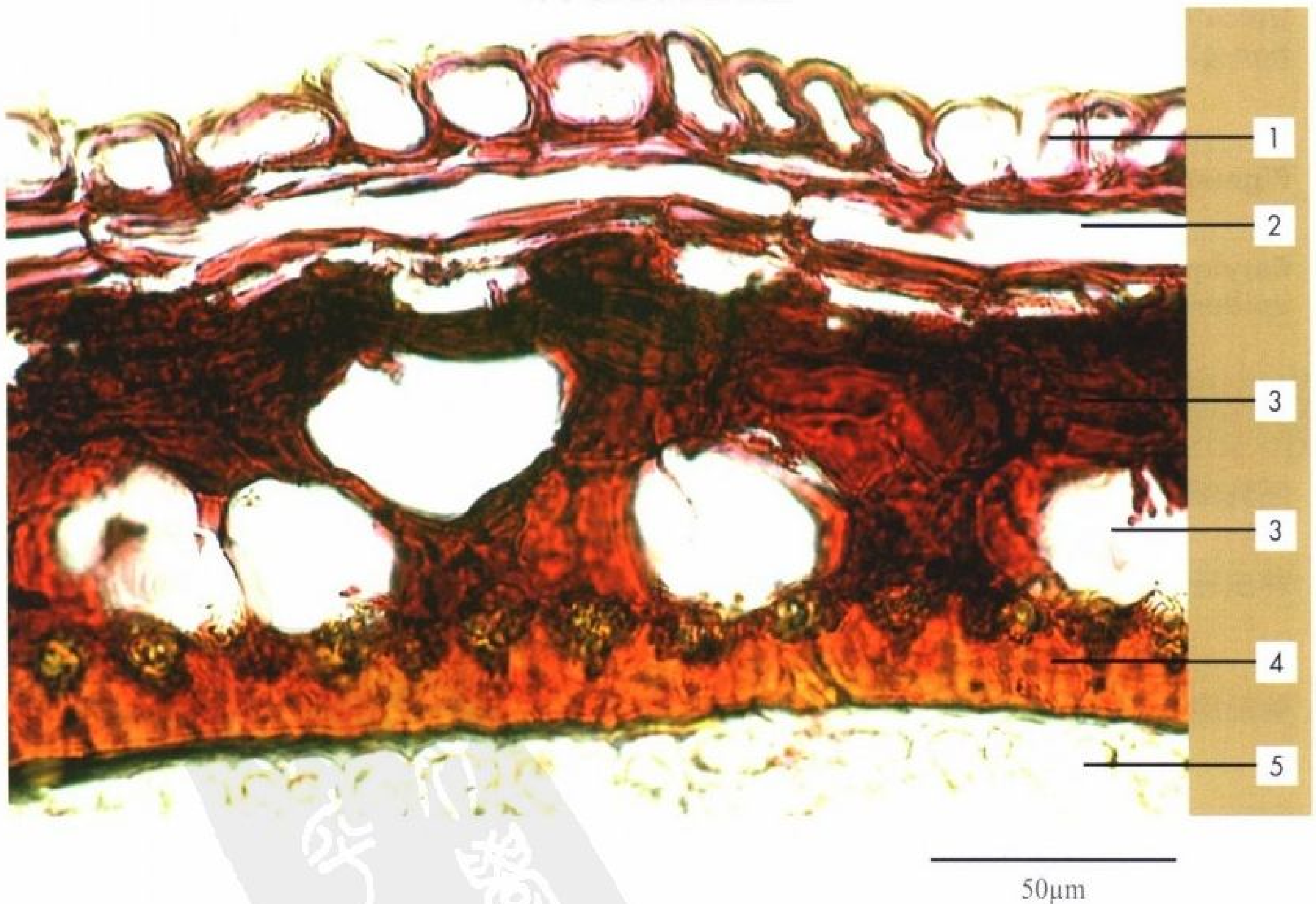


The dried near-ripe seed of *Alpinia katsumadai* Hayata. (Fam. Zingiberaceae).
姜科植物草豆蔻的干燥近成熟种子。

Sketch of transverse section of seed
种子横切面简图



Transverse section of seed
种子横切面组织图



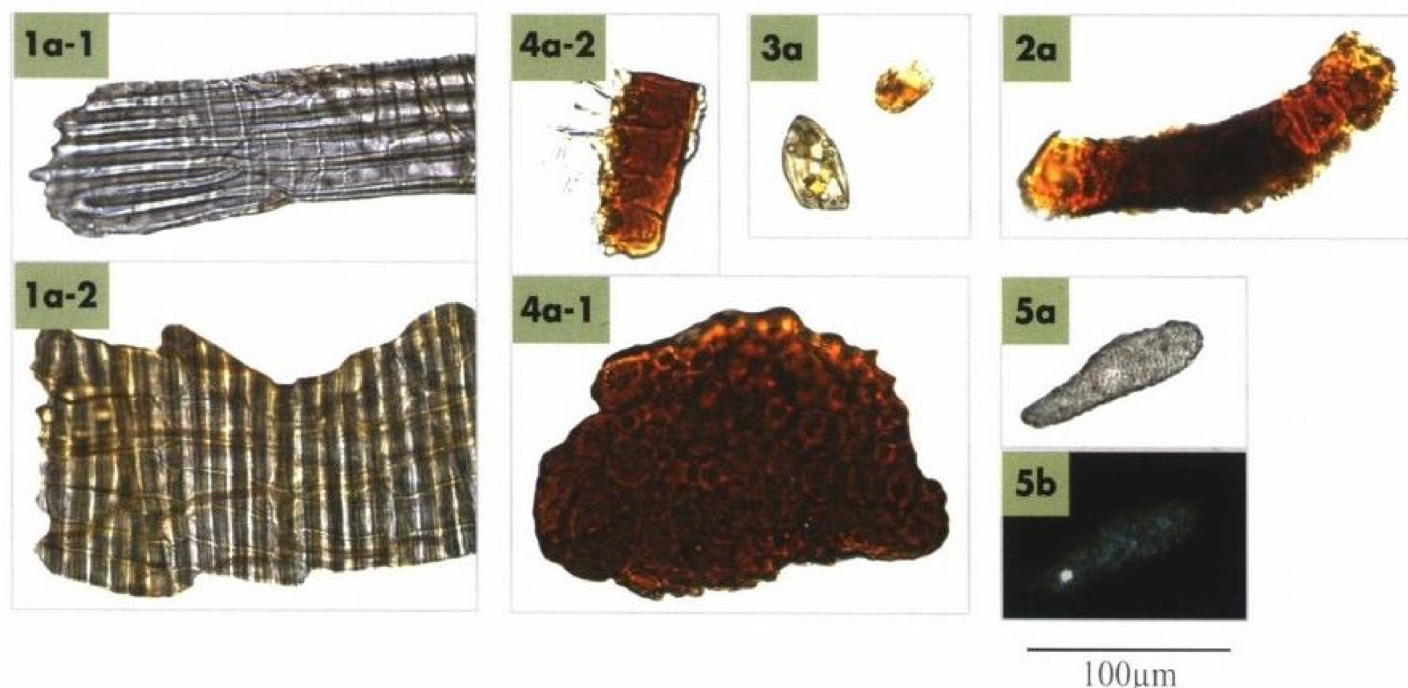
Transverse section of ripe seed

1. Epidermal cells of testa	Subrounded, with thickened walls.
2. Hypodermis	Consisting of 1~3 rows of parenchymatous cells, slightly elongated tangentially.
3. Pigment layer	Consisting of several rows of brown cells, scattered with 1~2 rows of subrounded oil cells, about 50μm in diameter.
4. Endotesta	Consisting of 1 row of palisade sclerenchymatous cells, brownish-red, with extremely thickened inner and lateral walls, and small lumina containing silica masses.
5. Perisperm	Cells containing starch granules, prisms of calcium oxalate and few fine cluster crystals.

种子横切面组织图注

1. 种皮表皮细胞	类圆形，壁较厚。
2. 下皮层	为1～3列薄壁细胞，略切向延长。
3. 色素层	为数列棕色细胞，其间散有类圆形油细胞1～2列，直径约50μm。
4. 内种皮	为1列栅状厚壁细胞，棕红色，内壁与侧壁极厚，胞腔小，内含硅质块。
5. 外胚乳	细胞含淀粉粒及草酸钙方晶和少数细小簇晶。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Epidermal cells of testa and hypodermal cells	Surface view of epidermal cells (1a-1): Stripe-shaped, slightly thickened walls, usually vertical to hypodermal cells. Surface view of hypodermal cells (1a-2): Long-polygonal or subrectangular.
2. The layers of pigment cells	Shrivelled with indistinct layer border, containing reddish-brown contents, and usually broken into irregular masses of pigment.
3. Oil cells	Scattered among the layers of pigment cells, subrounded or oblong and containing yellowish-green oily contents.
4. Sclerenchymatous cells of endotesta	Yellowish-brown or reddish-brown. Surface view (4a-1): polygonal, with thickened and unlignified walls, and lumina containing silica mass. Section view (4a-2): 1 layer of cells, palisade-like, with extremely thickened inner and leteral walls, lumina outward eccentric containing silica masses.
5. Perisperm cells	With masses of starch granules, some containing fine prisms of calcium oxalate. Starch granules black and cruciate shape, crystals brightly yellowish-white in color under a polarizing microscope.

图注

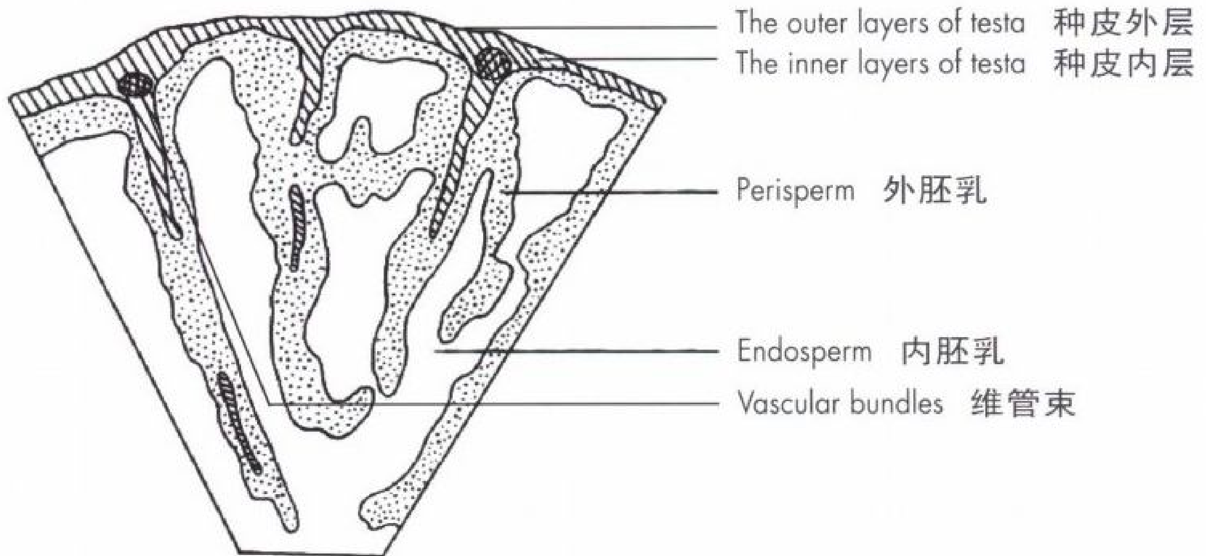
1. 种皮表皮细胞与下皮细胞	表皮细胞表面观(1a-1)呈长条形，壁稍厚，常与下皮细胞上下层垂直排列；下皮细胞表面观(1a-2)长多角形或类长方形。
2. 色素层细胞	皱缩，界限不清楚，含红棕色物，细胞多破碎呈不规则色素块。
3. 油细胞	散列于色素层细胞间，呈类圆形或长圆形，含黄绿色油状物。
4. 内种皮厚壁细胞	黄棕色或红棕色，表面观(4a-1)多角形，壁厚，非木化，胞腔内含硅质块；断面观(4a-2)细胞1列，栅状，内壁及侧壁极厚，胞腔偏外侧，内含硅质块。
5. 外胚乳细胞	充满淀粉粒集结成的淀粉团，有的包埋有细小草酸钙方晶。偏光显微镜下淀粉粒呈黑十字状，结晶呈亮黄白色。



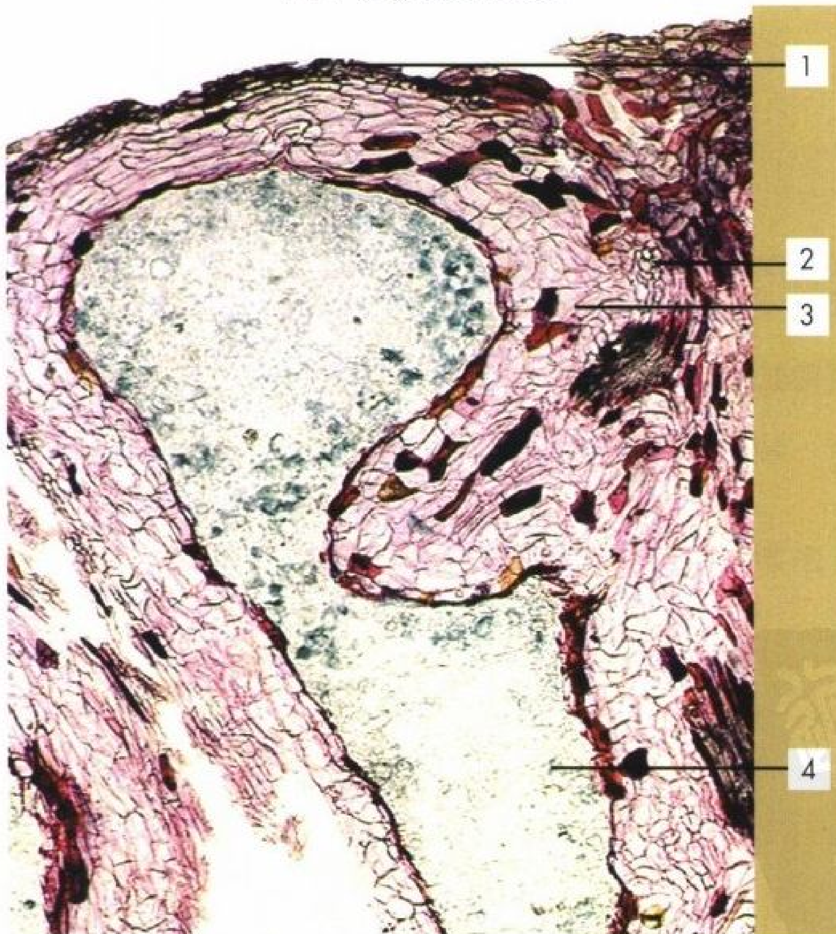
槟榔 Binglang

The dried ripe seed of *Areca catechu* L. (Fam. Palmae).
棕榈科植物槟榔的干燥成熟种子。

Sketch of transverse section of seed
种子横切面简图



Transverse section of seed
种子横切面组织图



100μm

Transverse section of seed

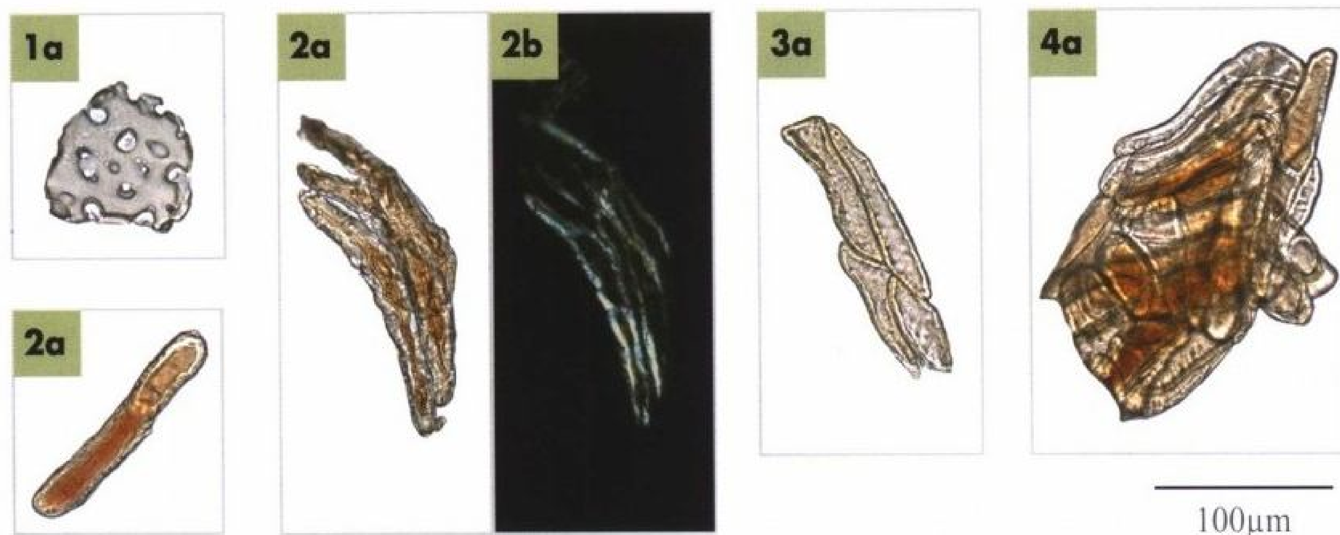
1. The outer layers of testa	Consisting of several rows of flattened stone cells, elongated tangentially, containing reddish-brown contents; stone cells varying in shape and size, usually with intercellular space.
2. The inner layers of testa	Consisting of several rows of parenchymatous cells, containing reddish-brown contents, and scattered with few vascular bundles.
3. Perisperm	Relatively narrow, the inner layers of testa and perisperm usually inserting into endosperm, forming crisscross tissue.
4. Endosperm	Cells white, polygonal, walls thickened, pits large, containing oil droplets and aleurone grains.

种子横切面组织图注

1. 种皮外层	为数列切向延长的扁平石细胞，内含红棕色物；石细胞形状、大小不一，常有细胞间隙。
2. 种皮内层	为数列薄壁细胞，内含红棕色物，并散有少数维管束。
3. 外胚乳	较狭窄，种皮内层与外胚乳常插入内胚乳中，形成错入组织。
4. 内胚乳	白色，多角形，壁厚，纹孔大，含油滴及糊粉粒。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Cells of endosperm	Numerous, mostly broken, colorless, complete ones irregular polygonal or subsquare, intercellular layers indistinct, 56~112μm in diameter, wall of cells 6~11μm thick, pits abundant, very big, subrounded or rectangular-rounded, 8~19μm in diameter.
2. Cells of perisperm	Subsquare, subpolygonal or strip-shaped, 40~72μm in diameter, wall of cells about 8μm thick, pit canals distinct. Most luminas filled with reddish-brown or dark brown mass. Brightly white and reddish-brown under a polarizing microscope.
3. Stone cells of testa	Subrounded, polygonal, fusiform or irregular in shape, 24~64μm in diameter, wall of cells 5~12μm thick, pale yellowish-brown, few pits, slit-shaped, some luminas filled with reddish-brown mass.
4. Cells of endocarp	Irregularly polygonal, subrounded or elliptical in shape, 48~88μm in diameter, wall of cells about 3μm thick, pits abundant and distinct, relatively big, the upper and lower layers interlacing.

图注

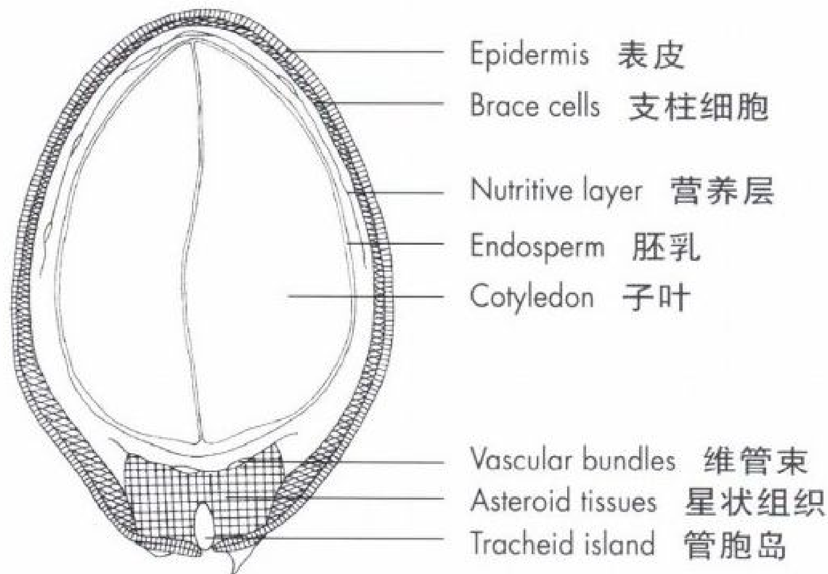
1. 内胚乳细胞	极多，多破碎，无色，完整者呈不规则多角形或类方形，胞间层不甚明显，直径56~112μm，壁厚6~11μm，纹孔较多，甚大，类圆形或矩圆形，直径8~19μm。
2. 外胚乳细胞	类方形、类多角形或长条形，直径40~72μm，壁厚约8μm，孔沟明显，大多数胞腔内充满红棕色或深棕色物。偏光显微镜下呈亮白色和红棕色。
3. 种皮石细胞	类圆形、多角形，纺锤形或不规则形。直径24~64μm，壁厚5~12μm，淡黄棕色，纹孔少数，裂缝状，有的胞腔内充满红棕色物。
4. 内果皮细胞	呈不规则多角形、类圆形或椭圆形，直径48~88μm，壁厚约3μm，纹孔较多，明显，较大，上下层交迭。

刀豆 Daodou

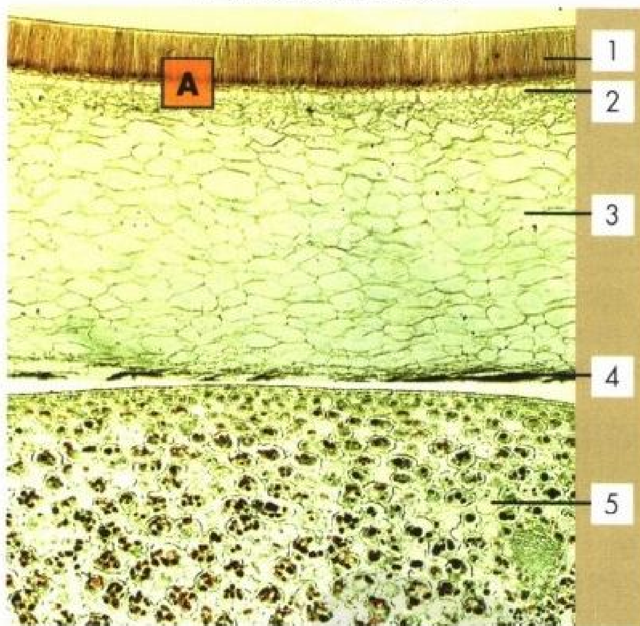


The dried ripe seed of *Canavalia gladiata* (Jacq.) DC. (Fam. Fabaceae).
豆科植物刀豆的干燥成熟种子。

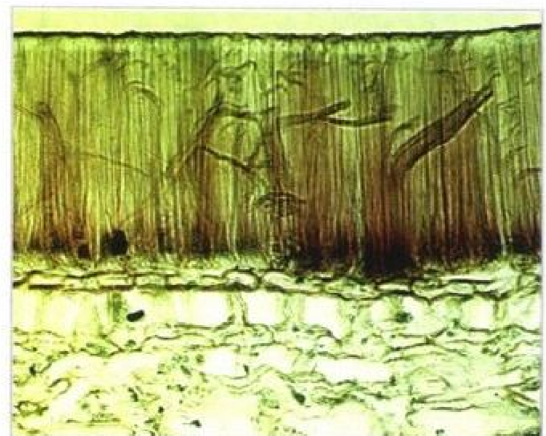
Sketch of transverse section of seed
种子横切面简图



Transverse section of seed
种子横切面组织图



A Palisade cells and supporting cells of testa
种皮栅栏细胞和支持细胞

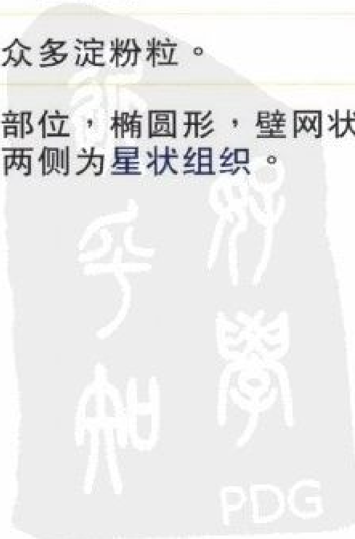


Transverse section of seed

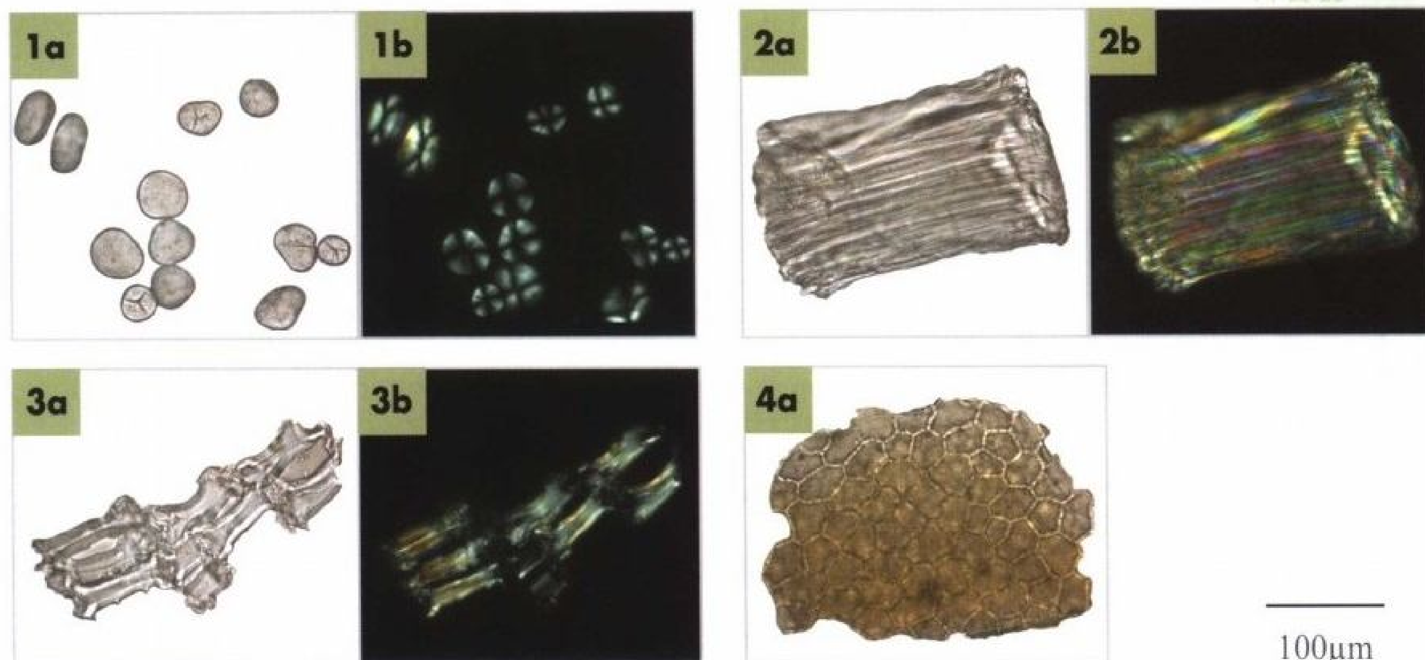
1. Epidermis	Consisting of 1 row of palisade cells, 2 rows at the hilum, covered with cuticle, luciferous bands distinct.
2. Brace cells	2~6 rows, dumbbell-shaped.
3. Nutritive layer	Consisting of over 10 rows of parenchymatous cells, tangential elongated, obliterated cells inside and with vascular bundles.
4. Endosperm	Several rows of cells, polygonal.
5. Cotyledon	Containing numerous starch granules in cells.
Tracheid island	Consisting in hilum, elliptical, cells with reticulately thickened walls. Surrounded by 4~5 layers of parenchymatous cells, **asteroid tissues** consisting in double sides of tracheid island.

种子横切面组织图注

1. 表皮	为1列栅栏细胞，种脐处2列，外被角质层，光辉带明显。
2. 支柱细胞	2~6列，呈哑铃状。
3. 营养层	由10多列切向延长的薄壁细胞组成，内侧细胞呈颓废状；有维管束。
4. 胚乳	细胞数列，多角形。
5. 子叶	细胞内含众多淀粉粒。
管胞岛	位于种脐部位，椭圆形，壁网状增厚。周围有4~5层薄壁细胞，其两侧为星状组织。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Abundant, mainly simple granules, subrounded, orbicular-ovate, kidney-shaped or irregular. Hilum distinct, dotted, slit-shaped or Y-shaped. Compound granules rare. Showing black, cruciate shape under a polarizing microscope.
2. Palisade cells of testa	In groups, colorless. In the lateral view: 1 row of cells or 2 rows, slender cylindrical, arranged densely, covered by cuticle, luciferous bands distinct. Showing polychrome in color under a polarizing microscope.
3. Brace cells of testa	1 or several rows of cells, some in groups or scattered singly, colorless, dumbbell shape in the lateral view, walls relatively thick, lumina clear. Showing bright yellowish-white in color under a polarizing microscope.
4. Endosperm cells	Subsquare or polygonal, walls thickened with bead-like form, lumina containing oil droplets.

图注

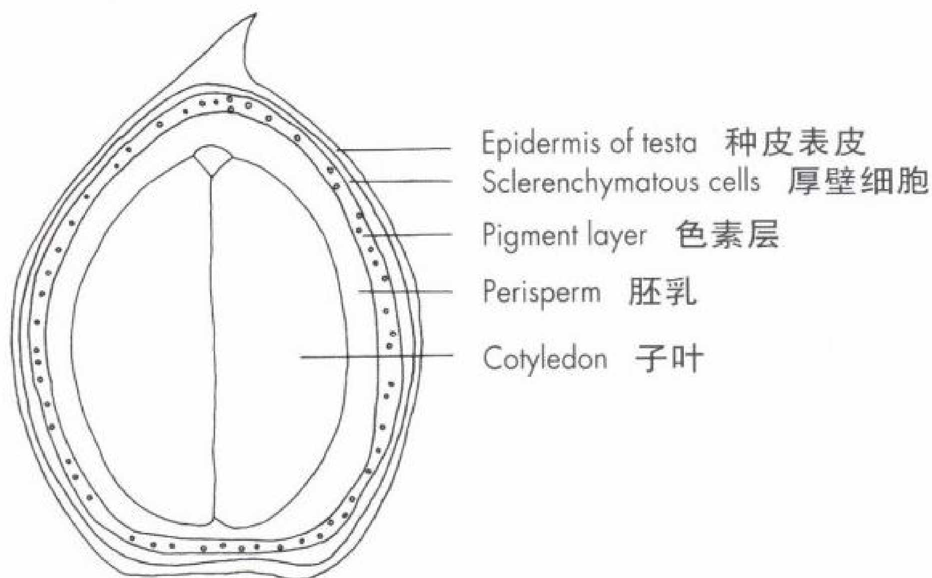
1. 淀粉粒	较多，主要为单粒，类圆形、卵圆形、肾形或不规则形。脐点明显，点状、裂缝状、三叉状。复粒较少。偏光下呈黑十字现象。
2. 种皮栅状细胞	成片，无色。侧面观：细胞1列，有的2列，呈细长柱形，排列紧密，外被角质层，光辉带明显。偏光下呈多彩色。
3. 种皮支柱细胞	1列至数列，数个成群或单个散离，无色，侧面观呈哑铃状，壁较厚，胞腔明显。偏光下呈亮黄白色。
4. 胚乳细胞	类方形或多角形，壁略呈连珠状增厚，胞腔内可见油滴。

橘核 Juhe

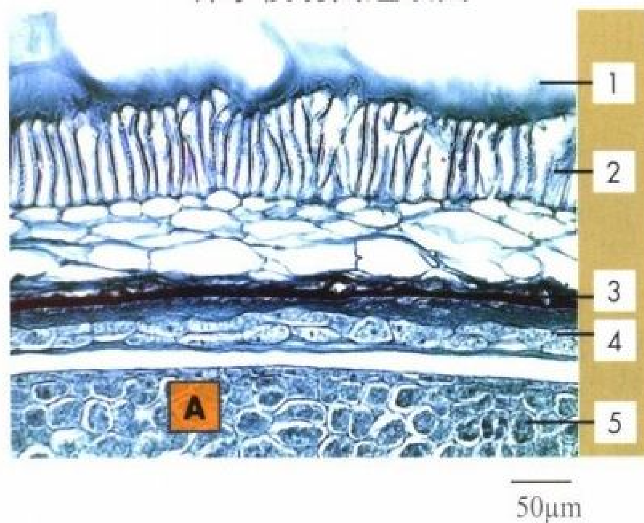


The dried ripe seed of *Citrus reticulata* Blanco and its cultivated varieties (Fam. Rutaceae).
芸香科植物橘及其栽培变种的干燥成熟种子。

Sketch of transverse section of seed
种子横切面简图

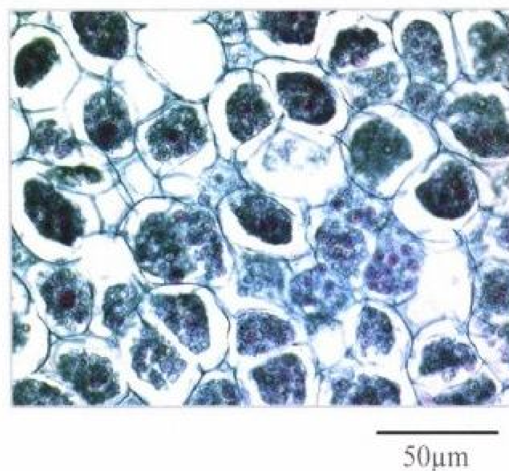


Transverse section of seed
种子横切面组织图



50μm

Cotyledon cells
子叶细胞



50μm



Transverse section of seed

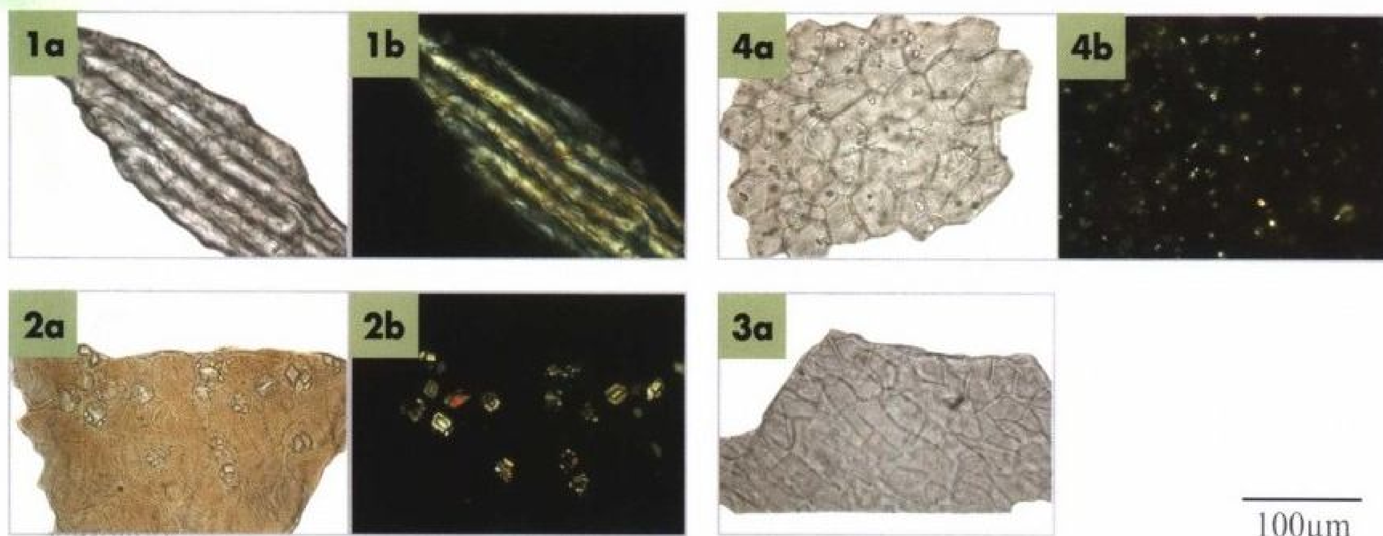
1. Epidermis of testa	Consisting of layers of mucilage cells.
2. Sclerenchyma	1 row of cells, arranged into palisade; outer walls integrated or with a tail-like convex at the upper end; cell walls uneven in thickness, lignified, with pits.
3. Pigment layer	Containing orange or yellowish-brown contents, and prisms of calcium oxalate in cells.
4. Endosperm	3~4 rows of cells, containing oil droplets; some cell walls torulosely thickening.
5. Cotyledon	Containing fine clusters or prisms of calcium oxalate, fatty oil droplets and needle-clustered crystals of hesperidin in cells.

种子横切面组织图注

1. 种皮表皮	为黏液细胞层。
2. 厚壁组织	1列细胞，排成栅状，外壁完整或上端呈尾状突起，壁厚薄不均，木化，具纹孔。
3. 色素层	含橙黄色或黄棕色物，并含草酸钙方晶。
4. 胚乳	3~4列，有的壁连珠状增厚，含脂肪油滴。
5. 子叶	含细小草酸钙簇晶或方晶，并含脂肪油滴及针簇状橙皮苷结晶。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Sclerenchyma cells of testa	Present in groups or becoming broken dispersedly distributed, colorless or pale yellow. Visible under a polarizing microscope. Fibrous in the section view, the endings blunt, the walls thick and lignified; with cruciate, V-shaped or obliquely elliptical pits. In the lateral view, the cells showing flat rectangular, stone-cell like. In the transverse section: the cells showing palisade stone-cell like, with the complete outer walls or tail-like projections, the cells overlapped with pigment layer.
2. Prisms of calcium oxalates	Present in yellowish-green, orange or yellowish-brown obliterated pigment tissues; the crystal cells subround or elliptical, highly compacted with thin walls; the crystals square, subsquare, polygonal, double-conical or rhombic. Showing polychrome in color under a polarizing microscope.
3. Endosperm cells	Often linked to the pigment layer, polygonal in shape; with some walls being bead-like thickened, containing fatty oil droplets.
4. Cotyledonous cells	Colorless or pale green; subround; containing tiny clusters or prisms of calcium oxalates; containing fatty oil droplets, needle-clustered crystals of hesperidin visible. Visible under a polarizing microscope.

图注

1. 种皮厚壁细胞	成片或破碎散在，无色或淡黄色。偏光显微镜下可见。切向纵断面观纤维状，末端钝圆，壁厚，木化，具十字形、人字形或斜椭圆形纹孔；侧面观呈类扁平长方形，似石细胞状；横断面观形如栅状石细胞，外壁完整或可见尾状突起。厚壁细胞与色素层上下相连。
2. 草酸钙方晶	成片存在于黄绿色、橙黄色或黄棕色颓废的色素层组织中。含晶细胞类圆形或椭圆形，密集，壁薄，结晶方形、类方形、多面形、双锥形或菱形。偏光显微镜下呈多彩色。
3. 内胚乳细胞	常与色素层相连。呈多角形，有的壁连珠状增厚，含脂肪油滴。
4. 子叶细胞	无色或淡绿色。类圆形，含细小草酸钙簇晶或方晶，并含脂肪油滴；橙皮苷结晶可见，针簇状。偏光显微镜下可见。

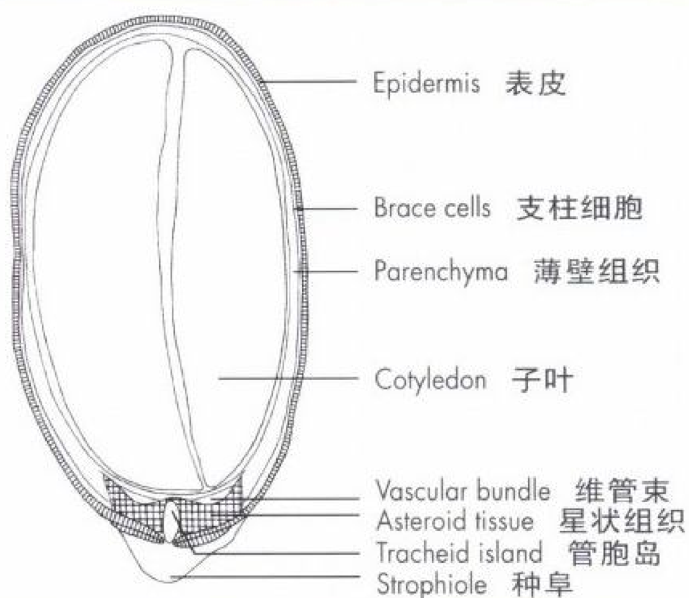


白扁豆 Baibiandou

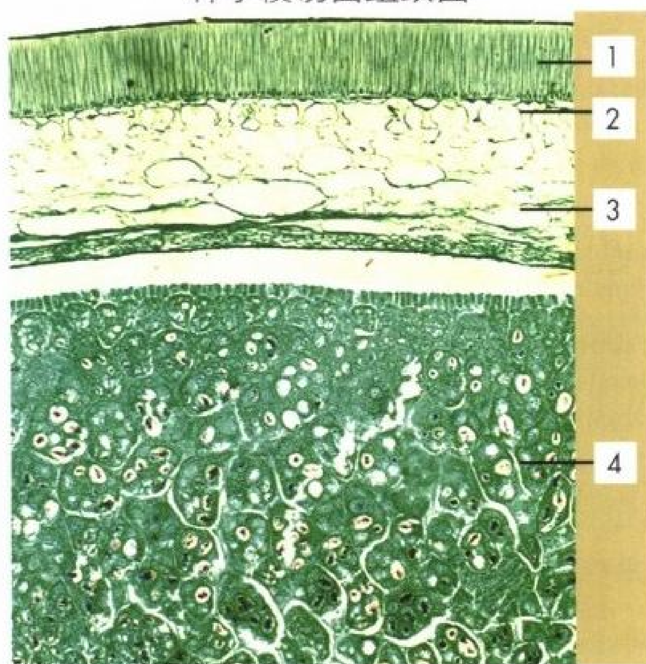
The dried ripe seed of *Dolichos lablab* L. (Fam. Leguminosae).

豆科植物扁豆的干燥成熟种子。

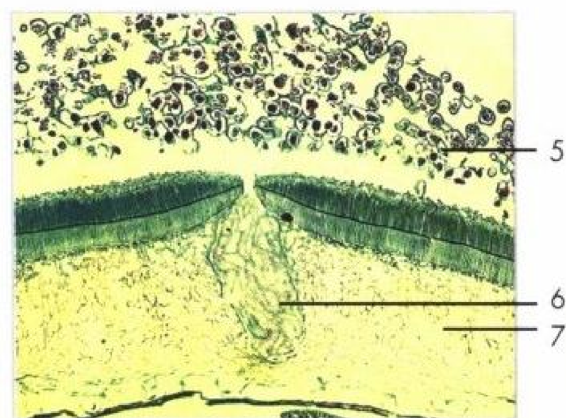
Sketch of transverse section of seed 种子横切面简图



Transverse section of seed 种子横切面组织图



Transverse section of hilum 种脐横切面



100μm

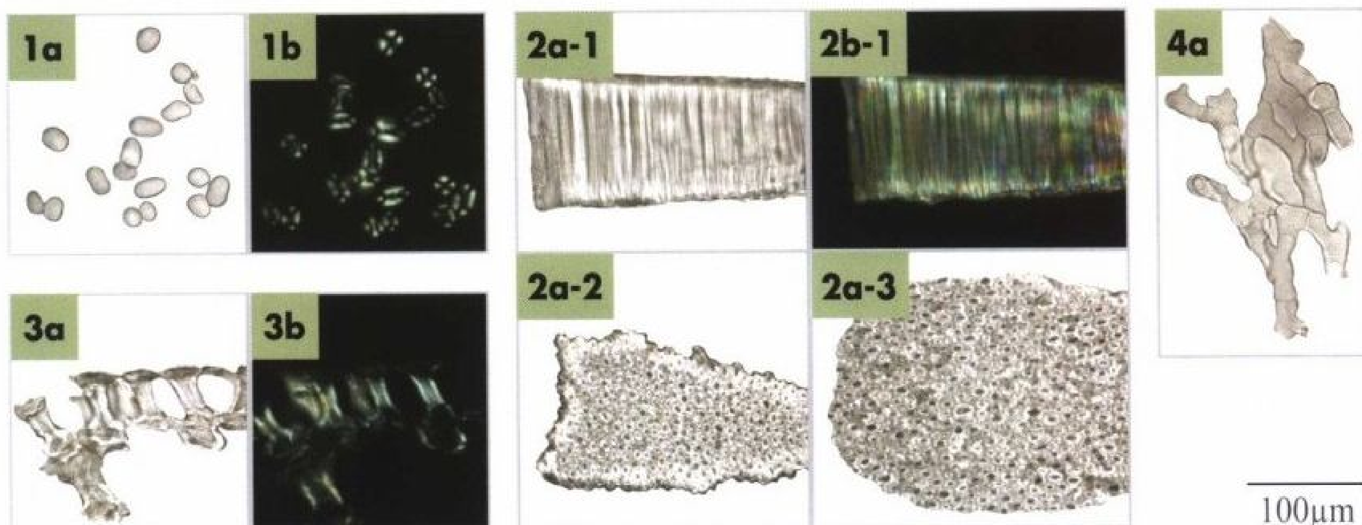
Transverse section of seed

1. Epidermis	1 row of palisade cells, 2 rows at the hilum, with distinct luciferous bands.
2. Brace cells	1 row, dumbbell-shaped, 3~5 rows at the hilum.
3. Parenchyma	10 rows of cells, with obliterated cells at the inner side.
4. Cotyledon	Containing numerous starch granules in cells.
Hilum Positon	
5. Strophiole	At the outer side of the palisade cells.
6. Tracheid island	At the inner side of the palisade cells, elliptical, with reticulate-thickened walls.
7. Asteroid tissue	On both sides of the tracheid island, asteroidal, with large intercellular spaces, some lumina containing brown contents (before dying treatment).

种子横切面组织图注

1. 表皮	为1列栅状细胞，种脐处2列，光辉带明显。
2. 支柱细胞	1列，呈哑铃状，种脐部位为3~5列。
3. 薄壁组织	细胞约10列，内侧细胞呈颓废状。
4. 子叶	细胞内含众多淀粉粒。
种脐部位	
5. 种阜	位于栅状细胞的外侧。
6. 管胞岛	位于栅状细胞的内侧，椭圆形，细胞壁网状增厚。
7. 星状组织	位于管胞岛两侧，细胞星芒状，有大形的细胞间隙，有的胞腔含棕色物(染色前可见)。

Main Powder Characteristics
主要粉末显微特征



Notes

1. Starch granules	Abundant, mainly simple granules, shape in a wide range of variety, such as subround, ovate, kidney-shaped, circularly triangular or irregular, few hilum clear, dotted, crisscross, cleft, compound granules occasionally present. Black cruciate shape was observed under a polarizing microscope.
2. Palisade cells of testa	Present in a group, colorless. In the lateral view(2a-1): 1 or 2 rows of cells, external walls very thick, with many longitudinal ridges, whereas internal walls thin with a luciferous band near the margin. On the top view(2a-2): the cells subpolygonal, showing the extremely thick walls and narrow luminas. In the bottom view(2a-3): the cells subrounded with thick walls and large lumina. Visible under a polarizing microscope.
3. Brace cells of testa	1 or several rows, present in groups or singly scattered, colorless. Dumb-bell shaped in the lateral view, with thin inner and outer walls, subrounded or ovate on the surface view, with annularly thickened walls and distinct lumina. Showing yellowish-white in color under a polarizing microscope.
4. Asteroid cells	Irregular, with wide and short branches, lumina containing brown contents, intercellular spaces large.

图注

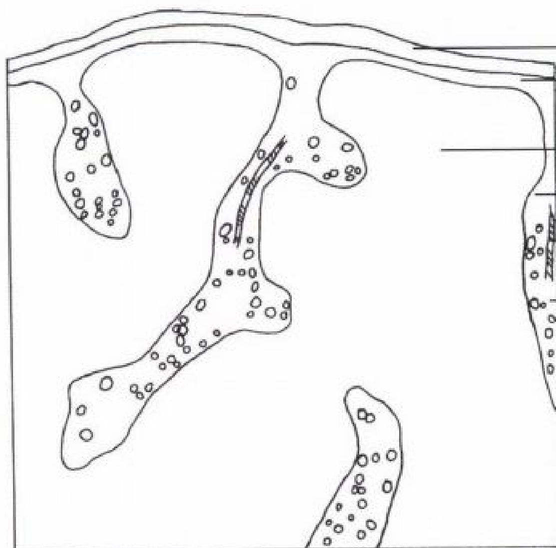
1. 淀粉粒	极多，主为单粒，类圆形、卵圆形、肾形、圆三角形或不规则形，脐点少数明显，点状、十字状、裂缝状。复粒偶见。偏光下可见黑十字现象。
2. 种皮栅状细胞	成片，无色。侧面观(2a-1)：细胞1列或2列，外壁极厚，有较多纵沟纹，内壁薄，光辉带位于细胞近外缘；顶面观(2a-2)：类多角形，壁极厚，胞腔细窄；底面观(2a-3)：类圆形，壁较厚，胞腔大。偏光下可见。
3. 种皮支持细胞	1列或多列，成群或单个散离，无色。侧(断)面观哑铃形，外壁和内壁薄；表面观类圆形或卵圆形，可见环状增厚壁，胞腔明显。偏光下可见亮黄白色。
4. 星状细胞	不规则形，分枝较宽而短，胞腔内含棕色物，有大形细胞间隙。

肉豆蔻 Roudoukou

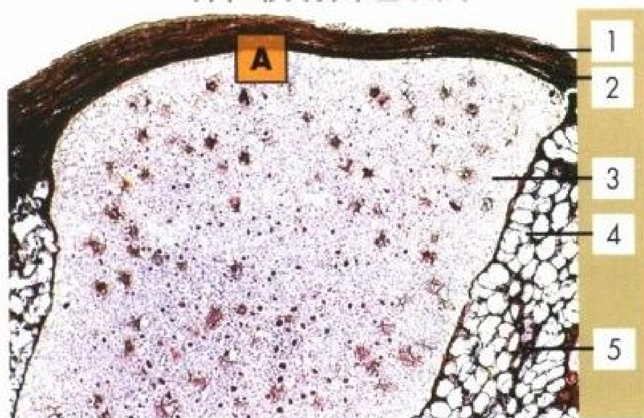


The dried kernel of *Myristica fragrans* Houtt. (Fam. Myristicaceae)
肉豆蔻科植物肉豆蔻的干燥种仁。

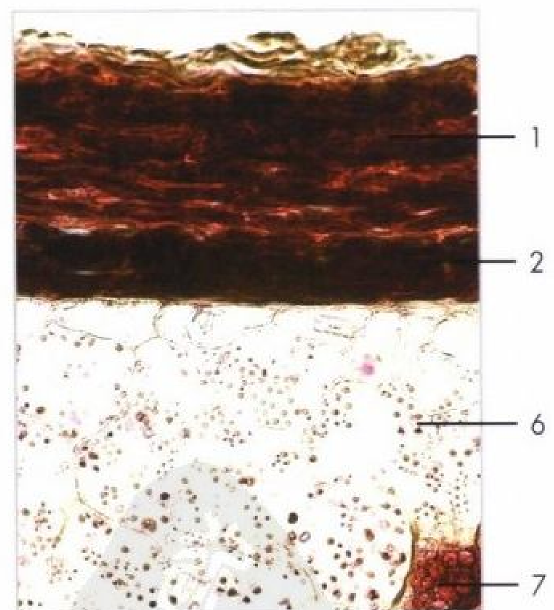
Sketch of transverse section of kernel 种仁横切面简图



Transverse section of kernel 种仁横切面组织图



A Transverse section of kernel (partial) 种仁横切面组织图(部分)

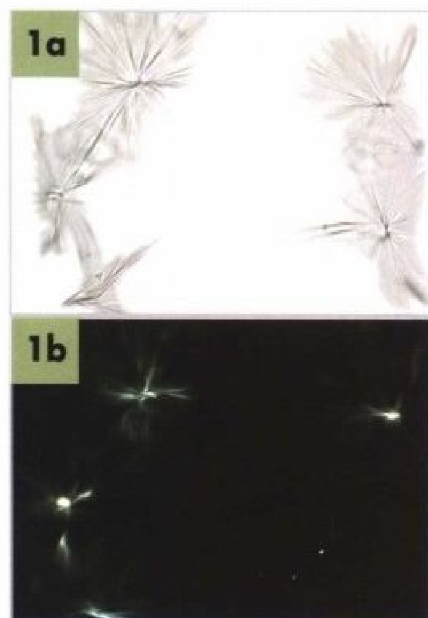


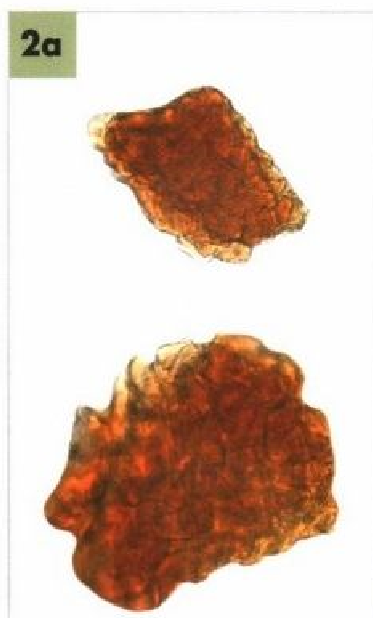
Transverse section of kernel

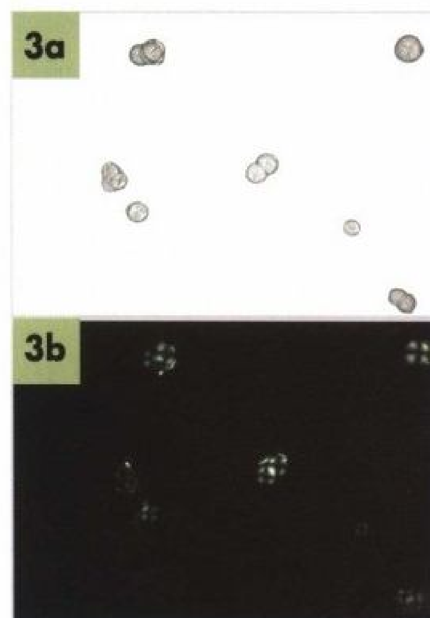
1. Outer layers of perisperm tissue	Consisting of more than 10 rows of flattened and shrivelled cells; containing brown contents; sometimes showing small prisms.
2. Inner layers of perisperm tissue	Dark brown, inserting to the pale-yellow endosperm, formed crisscross tissue with marble striations; containing numerous oil cells.
3. Endosperm	Cells with thin wall, subrounded, filled with starch granules, fatty oil droplets and aleurone granules; scattered with sparse pale-yellow cells.
4. Crisscross tissue	With small vascular bundles.
5. Vascular bundles	Small, visible.
6. Starch granules	Mostly simple granules; less compound granules consisting of 2~6 components; hilum distinct.
7. Aleurone granules	Treated with iodine solution and then mounting with glycerin, showing large aleurone granules among many bluish-black starch granules; while mounting with chloral hydrate, the fatty oil clumpy or lamellar in shape, and it will change into oil droplets when heated.

种仁横切面组织图注

1. 外层外胚乳组织	由10余列扁平皱缩细胞组成，内含棕色物，偶见小方晶。
2. 内层外胚乳组织	暗棕色，深入于浅黄色的内胚乳中，形成大理石花纹（错入组织），内含多数油细胞。
3. 内胚乳	细胞壁薄，类圆形，充满淀粉粒、脂肪油及糊粉粒，内有疏散的浅黄色细胞。
4. 错入组织	有小维管束。
5. 维管束	细小，可见。
6. 淀粉粒	多为单粒，少数为2~6分粒组成的复粒，脐点明显。
7. 糊粉粒	以碘液染色，甘油装置立即观察，可见在众多蓝黑色淀粉粒中杂有较大的糊粉粒。以水合氯醛装置观察，可见脂肪油常呈块片状、鳞片状，加热即成油滴状。







100μm

Notes

1. Fatty oil	Oil droplets abundant; the needle-clustered or feather-shaped crystals educed by fatty oil droplets if mounting in chloral hydrate. Visible under a polarizing microscope.
2. Perisperm cells	Present in groups; polygonal; the cells containing brownish-red, freshly red or yellowish-brown pigments.
3. Starch granules	Abundant; single granules subrounded or ovate, 3~24μm in diameter; hilumdotted, cleft-shaped or stellate; compound granules composed of 2~11 components. Black cruciate shape observed under a polarizing microscope.

图注

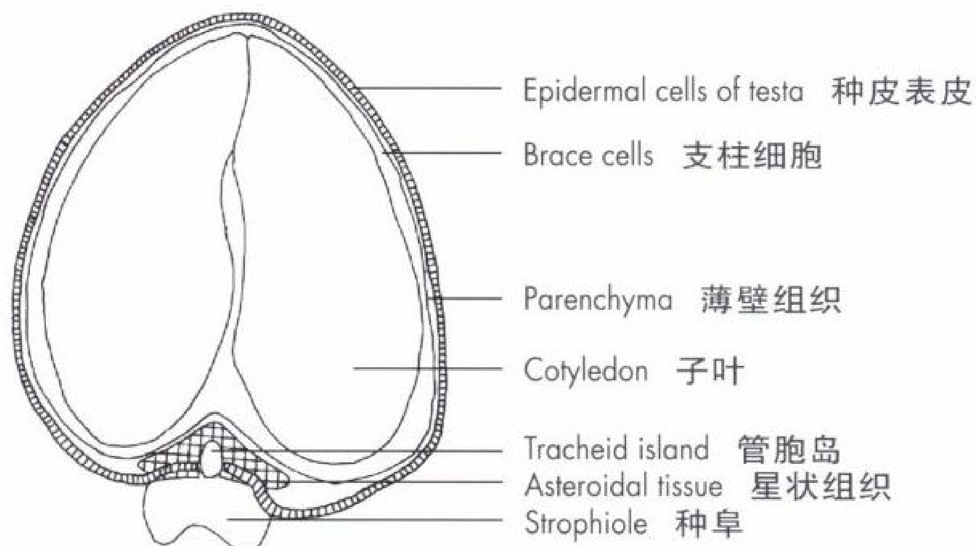
1. 脂肪油	油滴极多。用水合氯醛液装片后，脂肪油滴析出针簇状或羽毛状结晶。偏光显微镜下可见。
2. 外胚乳细胞	成片。呈多角形，内含棕红色、鲜红色或黄棕色色素物。
3. 淀粉粒	极多。单粒类圆形或卵圆形，直径3~24μm，脐点点状、裂缝状或星状；复粒由2~11分粒组成。偏光显微镜下可见黑十字状。

赤小豆 Chixiaodou

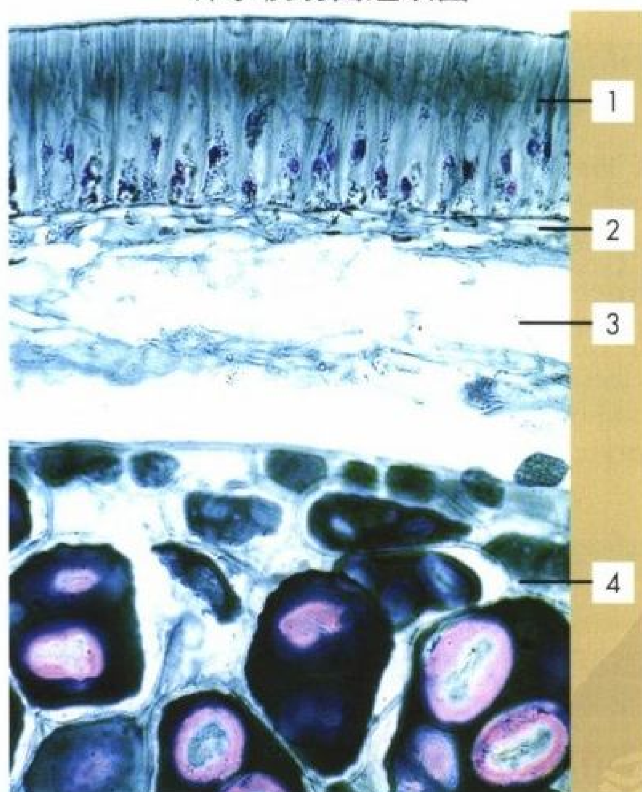


The dried ripe seed of *Phaseolus calcaratus* Roxb. (Fam. Leguminosae).
豆科植物赤小豆的干燥成熟种子。

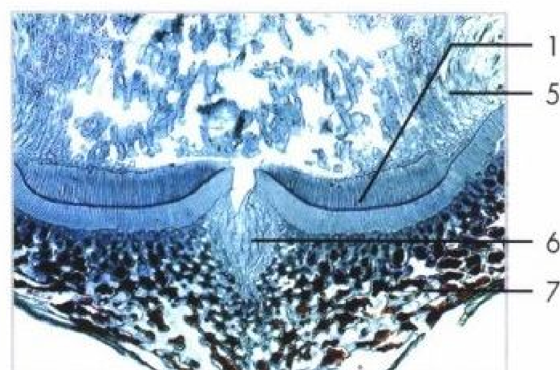
Sketch of transverse section of seed 种子横切面简图



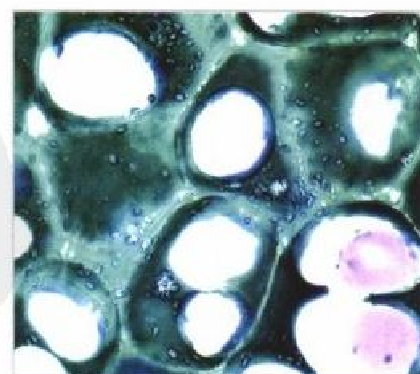
Transverse section of seed 种子横切面组织图



A Hilum position 种脐部位



B Cotyledon cells 子叶细胞



Transverse section of seed

1. Epidermal cells of testa	Consisting of 1 row of palisade cells and 2 rows at hilum; containing pale reddish-brown contents; luciferous bands distinct.
2. Brace cells	1 row, dumb bell-shaped.
3. Parenchyma	Over 10 rows of cells, showing obliterated cells inside.
4. Cotyledon	Containing numerous starch granules, and fine prisms and clusters of calcium oxalate in cells.

Hilum position

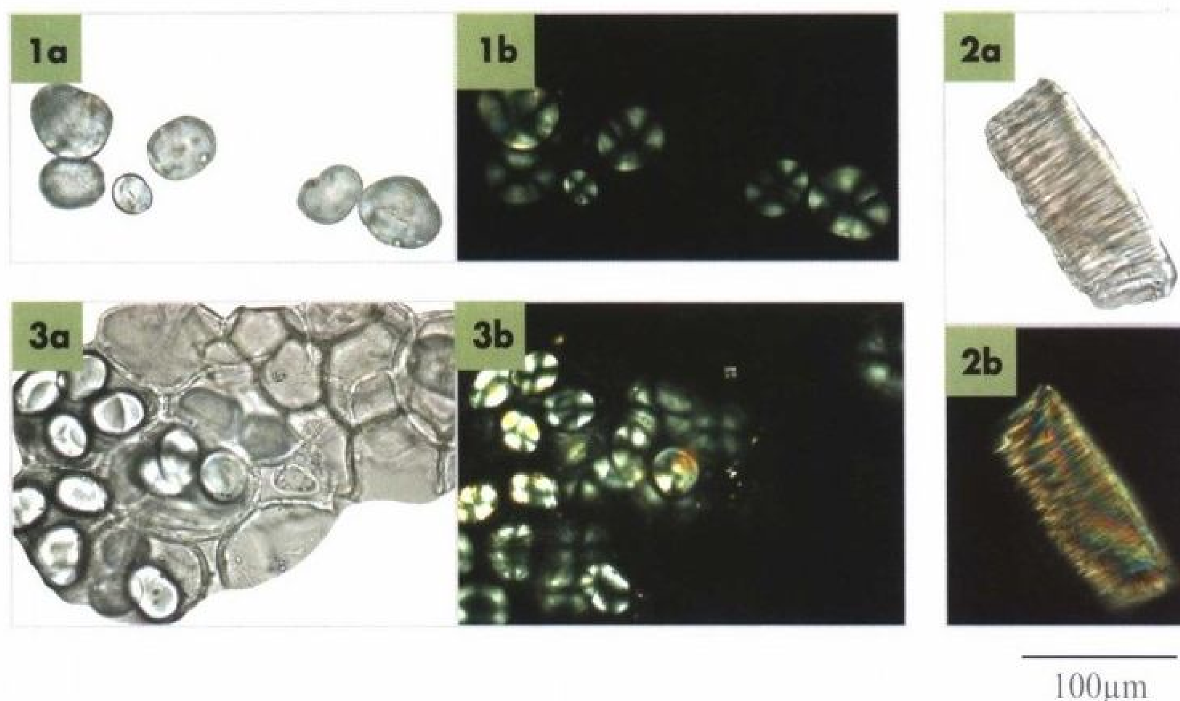
5. Strophiole	At the outer side of the palisade cells.
6. Tracheid island	At the inner side of the palisade cells, elliptical; cells with reticularly thickened walls.
7. Asteroidal tissue	Present on the double sides of tracheid island; cells asteroidal, with large intercellular spaces.

种子横切面组织图注

1. 种皮表皮细胞	为1列栅状细胞，种脐处2列，细胞内含淡红棕色物，光辉带明显。
2. 支柱细胞	1列，呈哑铃状。
3. 薄壁组织	细胞10余列，内侧细胞呈颓废状。
4. 子叶	细胞内含众多淀粉粒，并含有细小草酸钙方晶和簇晶。

种脐部位

5. 种阜	位于栅状细胞的外侧。
6. 管胞岛	位于栅状细胞的内侧，椭圆形，细胞壁网状增厚。
7. 星状组织	位于管胞岛两侧，细胞呈星芒状，有大型细胞间隙。



Notes

1. Starch granules	Numerous, singly scattered or present as groups by several granules in parenchymatous cells; simple granules elliptical, ovate, subrounded or subtriangular in shape; the striations clear, hilum cleft-shaped, dotted, or asteroidal; compound granules occasionally present, composed of 2~4 components. Black cruciate shape was clearly observed under a polarizing microscope.
2. Epidermal cells of testa	Arranged as palisade, polygonal on the surface view; the cell walls quite thick thus the lumina tiny and asteroidal; the cells arranged in rows in the lateral view; big osteroslereids present below some palisades. Visible under a polarizing microscope.
3. Cotyledonous tissue	Parenchymatous cells large, subpolygonal, elliptical or subrounded, full of starch granules, and fine clusters of calcium oxalate observed rarely. Starch and calcium oxalate are easily observed under a polarizing microscope.

图注

1. 淀粉粒	众多。单个散离或数个成团聚集在薄壁细胞中，单粒呈椭圆形、卵形、类圆形或类三角形，层纹大多明显，脐点多为裂缝状或点状、星状，偶见有复粒，由2~4复粒组成。偏光下呈明显黑十字状。
2. 种皮表皮细胞	栅状，表面观细胞多角形，壁甚厚，胞腔细小如星状，侧面观细胞排列成行。有的栅状组织下可见大型骨状石细胞。偏光下可见。
3. 子叶组织	子叶薄壁细胞大型，类多角形、椭圆形或类圆形，胞腔内充满淀粉粒，偶见细小草酸钙簇晶。偏光下淀粉粒与草酸钙簇晶易见。

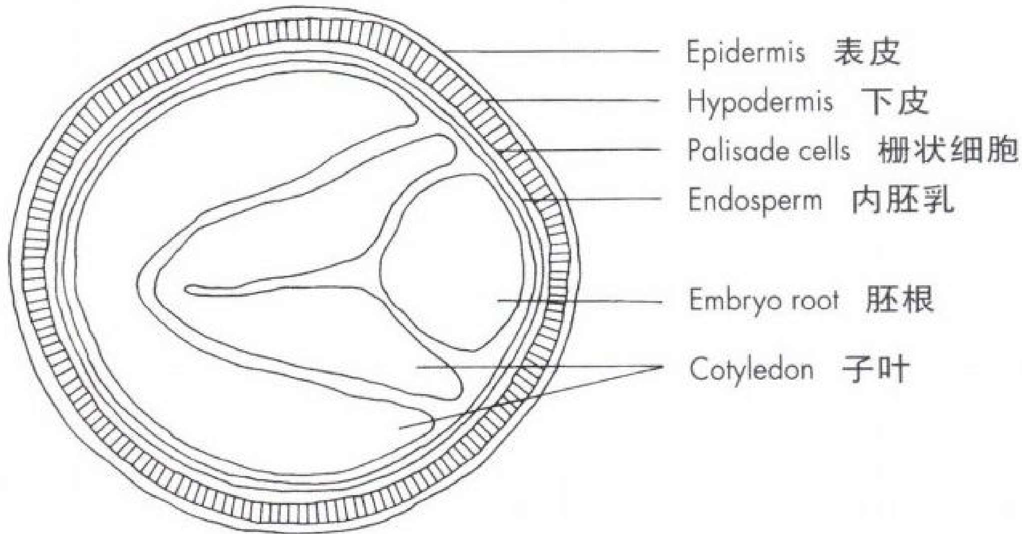


芥子 Jiezi

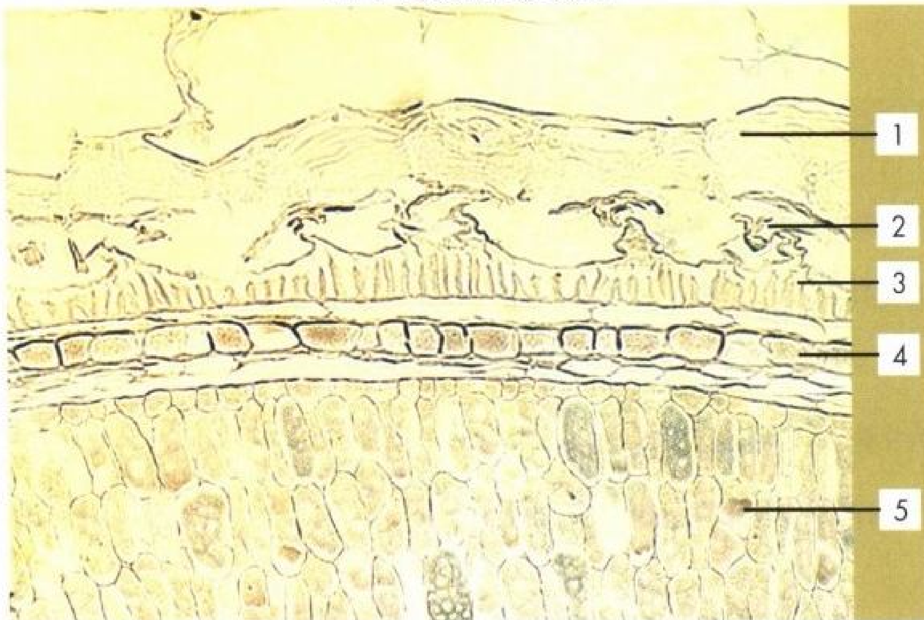
The dried ripe seed of *Sinapis alba* L. (Fam. Cruciferae).

十字花科植物白芥的干燥成熟种子。

Sketch of transverse section of seed
种子横切面简图



Transverse section of seed
种子横切面组织图



50μm



Transverse section of seed

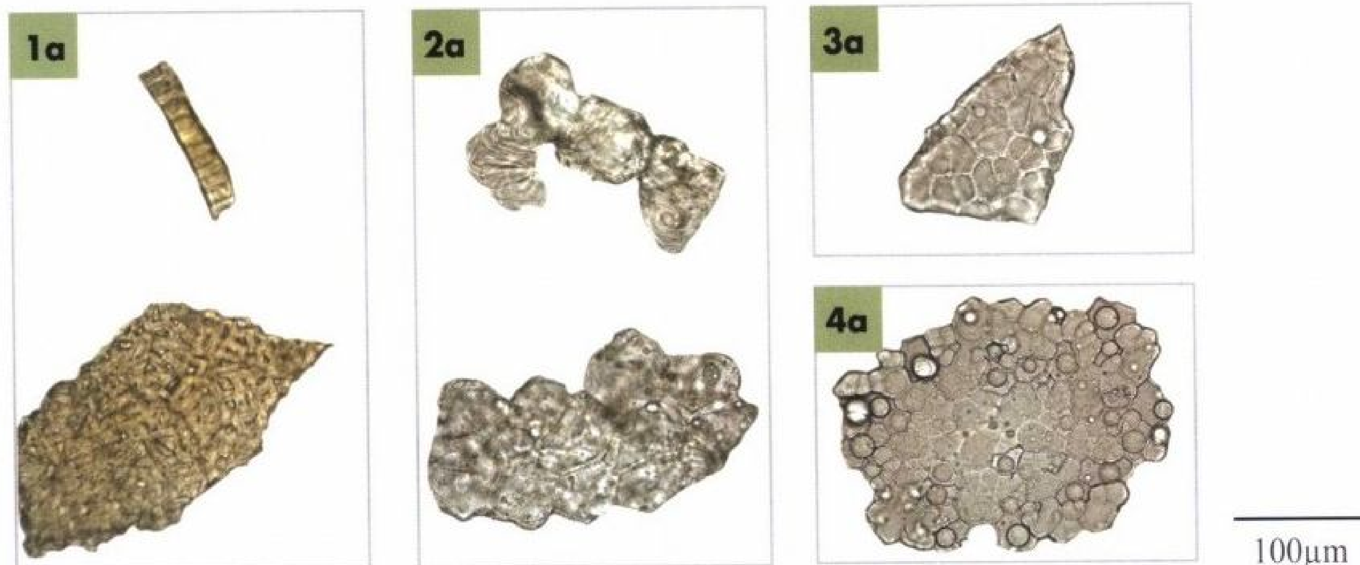
1. Epidermis of testa	Consisting of mucilage cells, with mucilage striations.
2. Hypodermis	Consisting of 2 rows of collenchymatous cells.
3. Palisade cells	1 row, with thickened inner and lateral walls, and thin outer wall.
4. Endosperm	Consisting of 1 row of subsquare cells, containing aleurone granules, double side of them with obliterated cells.
5. Cotyledons	Containing aleurone granules and fatty oil droplets.

种子横切面组织图注

1. 种皮表皮	为黏液细胞，有粘液纹理。
2. 下皮	为2列厚角细胞。
3. 栅栏细胞	1列，内壁及侧壁增厚，外壁菲薄。
4. 内胚乳	为1列类方形细胞，含糊粉粒，其内外两侧有颓废状细胞。
5. 子叶	细胞内含糊粉粒及脂肪油滴。



Main Powder Characteristics
主要粉末显微特征



Notes

1. Palisade cells of testa	Present in groups, pale yellow. 1 row of cells seen on the transverse view, the outer and middle-upper portion of lateral walls thin, while lower part of the lateral walls and inner walls thickened; polygonal or slightly elongated on the surface view, the anticlinal walls straight or fine undulantly curved.
2. Epidermal cells of testa	Mucilage cells, colorless or light yellow. Subsquare or slightly radially elongated on the transverse view, containing mucilage, the outer walls often broken, inner walls showing clubbed cellulose column unclearly; cells polygonal or subpolygonal on the surface view, central cellulose column hilum-like.
3. Hypodermal cells of testa	Large, usually shriveled, with unclear cellular boundaries, walls unevenly thickened.
4. Endosperm cells	Oblate rectangular on the transverse view, while polygonal on the surface view; aleurone granules, fatty oil droplets and grey granules present.

图注

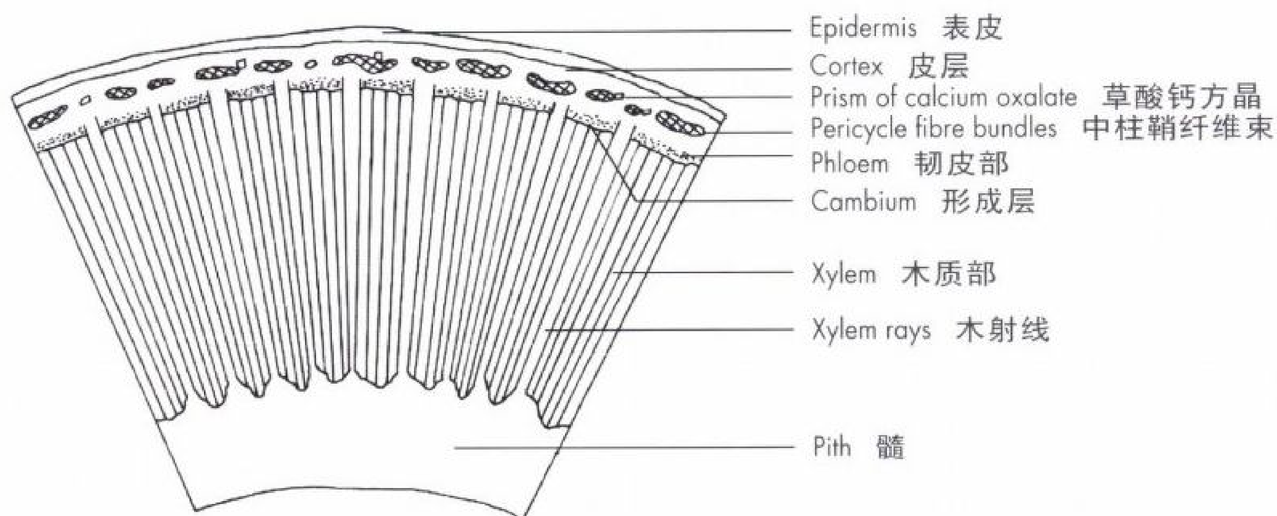
1. 种皮栅状细胞	成片，淡黄色。横断面观细胞1列，外壁及侧壁中上部薄，侧壁下部及内壁增厚；表面观类多角形或稍延长，垂周壁平直或细波状弯曲。
2. 种皮表皮细胞	为黏液细胞，无色或微黄色。横断面观呈类方形或稍径向延长，含黏液质，外壁常胀裂，内壁棒状的纤维素柱隐约可见；表面观细胞呈多角形或类多角形，中央纤维柱呈脐状。
3. 种皮下皮细胞	较大，多皱缩，细胞界限不甚清楚，壁不均匀增厚。
4. 内胚乳细胞	横断面观呈扁长方形，表面观类多角形，含糊粉粒、油滴及灰色颗粒物。

皂角刺 Zaojiaoci

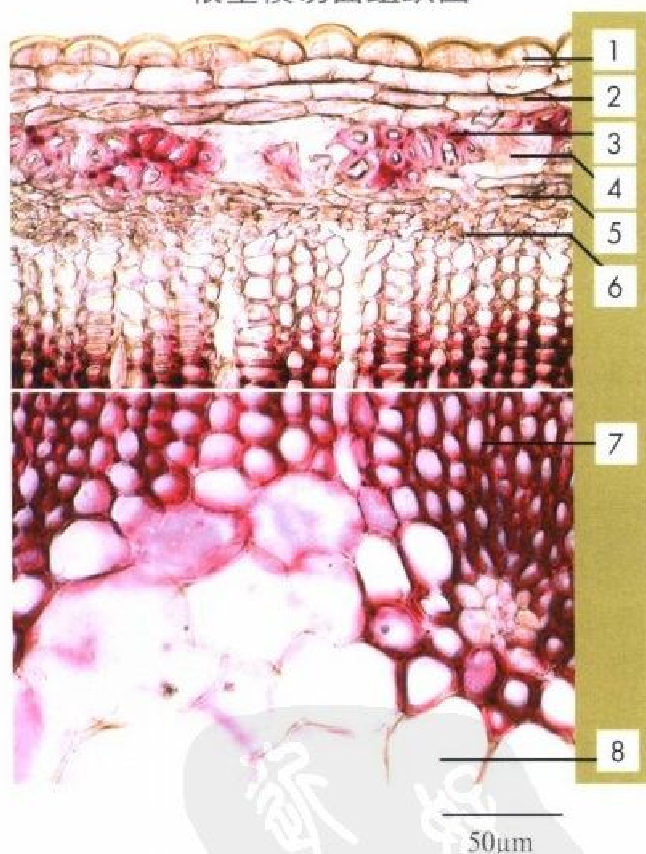


The dried spine of *Gleditsia sinensis* Lam. (Fam. Leguminosae).
豆科植物皂荚的干燥棘刺。

Sketch of transverse section of spine
棘刺横切面简图



Transverse section of spine
根茎横切面组织图

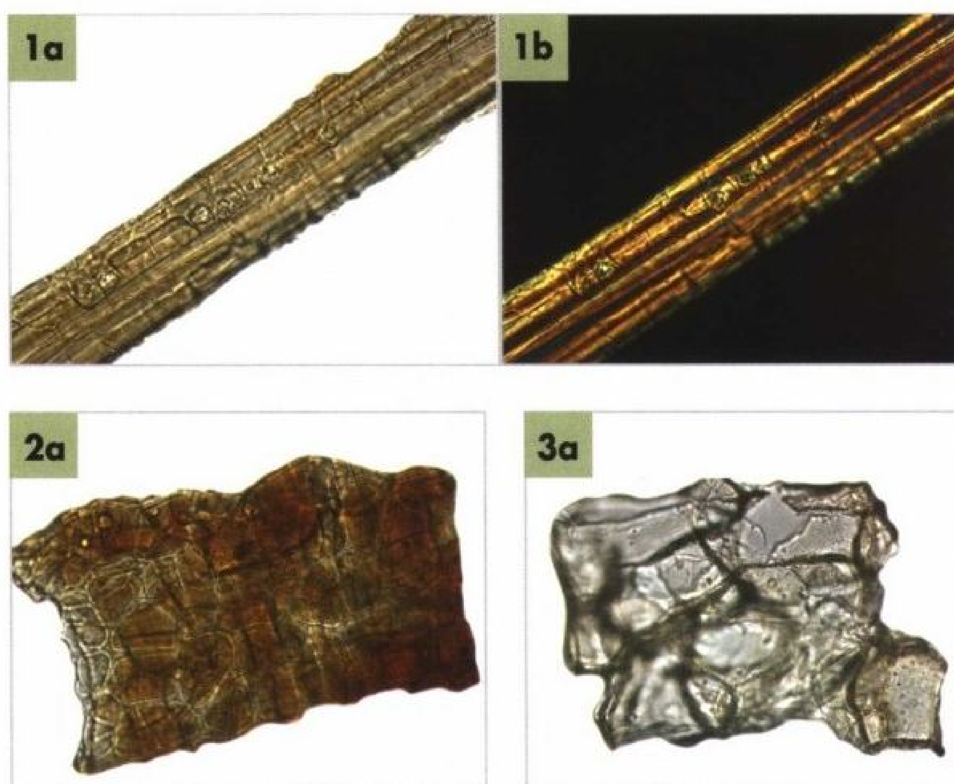


Transverse section of spine

1. Epidermis	1 row of cells, covered with cuticle, sometimes showing unicellular non-glandular hairs.
2. Cortex	Consisting 2~3 rows of parenchymatous cells, some cells containing brownish-red contents.
3. Pericycle fibre bundles	Interruptedly arranged in a ring, some surrounding parenchymatous cells of fibre bundles containing prisms of calcium oxalate.
4. Stone cells	Single or 2~3 in groups along the fibre bundles.
5. Phloem	Narrow.
6. Cambium	In a ring.
7. Xylem	Connected in a ring, xylem rays 1~2 rows of cells wide.
8. Pith	Broad, parenchymatous cells containing few starch granules.

棘刺横切面组织图注

1. 表皮	细胞1列，外被角质层，有时可见单细胞非腺毛。
2. 皮层	为2 ~ 3列薄壁细胞，细胞中有的含棕红色物。
3. 中柱鞘纤维束	断续排列成环，纤维束周围的薄壁细胞有的含草酸钙方晶。
4. 石细胞	单个或2 ~ 3个相聚在纤维束旁。
5. 韧皮部	狭窄。
6. 形成层	成环。
7. 木质部	连接成环，木射线宽1 ~ 2列细胞。
8. 髓	宽广，薄壁细胞含少量淀粉粒。



Notes

1. Pericycle fibres	Mostly broken, pale yellow, walls thickened and lumina unclear, surrounding parenchymatous cells containing prisms of calcium oxalate, prisms 17~22μm in diameter and clusters 6~8μm in diameter, forming crystal fibres. Fibre bundles sclerenchymatous, septate fibre, parenchymatous fibres with simple pits. Both fibres and crystals are showing polychrome under polarizing microscope.
2. Epidermal cells	Brown contents and small granular crystals visible, stoma present on the surface view.
3. Xylary parenchymatous cells	Square or subpolygonal in shape, with pits.

图注

1. 中柱鞘纤维	多碎断，微黄色，壁厚，胞腔不明显，周围薄壁细胞含草酸钙方晶，直径17~22μm，簇晶直径6~8μm，形成晶鞘纤维。纤维束厚壁性，分隔纤维，薄壁性纤维有的具单纹孔。偏光下纤维和晶体均呈多彩色。
2. 表皮细胞	有棕色内含物及小颗粒状晶体，表面观可见气孔。
3. 木薄壁细胞	方形或类多角形，具纹孔。

Chinese Index
药材中文名索引

九画

十画

十一画

十二画

十三画

十四画

十六画

十七画

PinYin Index
汉语拼音名索引

Latin Index
原植物拉丁名索引